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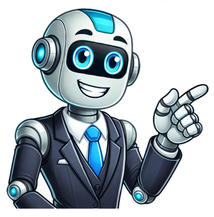

Local maximum and minimum are the points of the functions, which give the maximum and minimum range. The local maxima and local minima can be computed by finding the derivative of the function. The first derivative test and the second derivative test are the two important methods of finding the local maximum and local minimum.Let us learn
more about how to find the local maximum and minimum, the methods to find the local maximum and minimum, and the examples of local maximum and minimum. What Is Local Maximum and Minimum? The local maxima and minima are the input values for which the function gives the maximum and minimum output values respectively. The function
equation or the graphs are not sufficiently useful to find the local maxima and local minima points. The derivative of the function is very helpful in finding the local maximum and local minimum of the function.Let us consider a function f(x). The input value of \(x_1\) for which \(f(x_1)\) > 0, is called the local maxima, and \(f(x_1)\) is the local maximum
value, and the input value of \(x_1\), for which \(f(x_2)\) < 0, is called the local minima, and \(f(x_2)\) is the local minimum value. The local maximum and the minimum are calculated for only the defined interval and do not apply to the entire range of the function.Methods to Find Local Maximum and Minimum The local maximum and minimum can be
identified by taking the derivative of the given function. The first derivative test and the second derivative test are useful to find the local maximum and minimum. Let us understand more details, of each of these tests.First Derivative TestThe first derivative test helps in finding the turning points, where the function output has a maximum value or a
minimum value. For the first derivative test. we define a function f(x) on an open interval I. Let the function f(x) be continuous at a critical point c in the interval I. Here we have the following conditions to identify the local maximum and minimum from the first derivative test.If f (x) changes sign from positive to negative as x increases through c, i.e., if
f (x) > 0 at every point sufficiently close to and to the left of c, and f (x) < 0 at every point sufficiently close to and to the right of c, then c is a point of local maxima.If f (x) changes sign from negative to positive as x increases through c, i.e., if f (x) < 0 at every point sufficiently close to and to the left of c, and f (x) > 0 at every point sufficiently close to
and to the right of c, then c is a point of local minima.If f (x) does not change significantly as x increases through c, then c is neither a point of local maxima nor a point of local minima. In fact, such a point is called a point of inflection.The following steps are helpful to complete the first derivative test and to find the limiting points.Find the first
derivative of the given function, and find the limiting points by equalizing the first derivative expression to zero.Find one point each in the neighboring left side and the neighboring right side of the limiting point, and substitute these neighboring points in the first derivative functions.If the derivative of the function is positive for the neighboring point
to the left, and it is negative for the neighboring point to the right, then the limiting point is the local maxima.If the derivative of the function is negative for the neighboring point to the left, and it is positive for the neighboring point to the right, then the limiting point is the local minima.Second Derivative TestThe second derivative test is a systematic
method of finding the absolute maximum and absolute minimum value of a real-valued function defined on a closed or bounded interval. Here we consider a function f(x) which is differentiable twice and defined on a closed interval I, and a point x= k which belongs to this closed interval (I). Here we have the following conditions to identify the local
maximum and minimum from the second derivative test.x = k, is a point of local maxima if f'(k) = 0, and f''(k) < 0. The point at x= k is the locl maxima and f(k) is called the local maximum value of f(x).x = k is a point of local minima if f'(k) = 0, and f''(k) >0 . The point at x = k is the local minima and f(k) is called the local minimum value of f(x).The test
fails if f'(k) = 0, and f''(k) = 0. And the point x = k is called the point of inflection.The following sequence of steps facilitates the second derivative test, to find the local maxima and local minima of the real-valued function.Find the first derivative f'(x) of the function f(x) and equalize the first derivative to zero f'(x) = 0, to the limiting points \(x_1,
x_2\).Find the second derivative of the function f''(x), and substitute the limiting points in the second derivative\(f''(x_1), f''(x_2)\)..If the second derivative is greater than zero\(f''(x_1) > 0\), then the limiting point \((x_1)\) is the local minima.If the second derivative is lesser than zero \(f''(x_2) f(x) > f(d).Related TopicsThe following topics help for a
better understanding of local maximum and minimum. Examples on Local Maximum and Minimum Example 1: Find the local maxima and local minima of the function f(x) = 2x3 + 3x2 - 12x + 5., using the first derivative test.Solution:The given function is f(x) = 2x3 + 3x2 - 12x + 5f'(x) = 6x2 + 6x - 12f'(x) = 0; 6x2 - 6x - 12 = 0, 6(x2 + x - 2) = 0, 6(x - 1)
(x + 2) = 0Hence the limiting points are x = 1, and x = -2.Let us take the points in the immediate neighbourhood of x = 1. The points are {0, 2}.f'(0) = 6(02 + 0 - 2) = 6(-2) = -12, and f'(2) = 6(22 + 2 - 2) = 6(4) = +24The derivative of the function is negative towards the left of x = 1, and is positive towards the right. Hence x = 1 is the local
minima.Let us now take the points in the immediate neighborhood of x = -2. The points are {-3, -1}.f'(-3) = 6((-3)2 + (-3) - 2) = 6(4) = +24, and f'(-1) = 6((-1)2 + (-1) -2) = 6(-2) = -12The derivative of the function is positive towards the left of x = -2, and is negative towards the right. Hence x = -2 is the local maxima.Therefore, the local maxima is -2,
and the local minima is -1.Example 2: Find the local maxima and local minima of the function f(x) = x3 - 6x2+9x + 15. using the second derivative test.Solution:The given function is f(x) = x3 - 6x2+9x + 15.f'(x) = 3x2 - 12x + 9. Let us find the zeros of the expression. f'(x) = 0.f'(x) = 3(x2 - 4x + 3)x2 - 4x + 3 = 0 or (x - 1)(x - 3)=0.Here x = 1, and x =
3f''(x) = 6x - 12f''(1) = 6(1) - 12 = 6 - 12 = -6., f''(1) < 0, and x = 1 is the maxima.f''(3) = 6(3) - 12 = 18 - 12 = 6, f''(3) > 0, and x = 3 is the minima.Therefore by using the second derivative test, the local maxima is 1, with a maximum value of f(1) = 19, and the localminima is 3, with a minimum value of f(3) = 15View Answer >go to slidego to slideGreat
learning in high school using simple cuesIndulging in rote learning, you are likely to forget concepts. With Cuemath, you will learn visually and be surprised by the outcomes.Book a Free Trial ClassFAQs on Local Maximum and Minimum The local minimum and maximum can be found by differentiating the function and finding the turning points at
which the slope is zero. Further, these turning points can be checked through different methods to find the local maximum and minimum. The first derivative test or the second derivative test is helpful to find the local minimum and maximum.What Is the Difference Between Local Maxima and Absolute Maxima?The local maximum is a point within an
interval at which the function has a maximum value. The absolute maxima is also called the global maxima and is the point across the entire domain of the given function, which gives the maximum value of the function.What Are the Uses of Local Maximum and Minimum?The local maximum and minimum can be used to find the optimal solution for a
real-life problem situation, expressed in the form of an equation. The input values for which these expressions have a maximum or minimum output can be computed from the local maximum and minimum.,the free encyclopedia that anyone can edit.116,704 active editors 7,002,198 articles in EnglishThe English-language Wikipedia thanks its
contributors for creating more than seven million articles! Learn how you can take part in the encyclopedia's continued improvement.Logo of Namco LimitedNamco Limited was a Japanese multinational video game and entertainment company founded in 1955 by Masaya Nakamura which operated video arcades, amusement parks, produced video
games, films, toys, and arcade cabinets. In the 1960s, it manufactured electro-mechanical arcade games such as the 1965 game Periscope. It entered the video game industry after acquiring the Japanese division of Atari in 1974, distributing games such as Breakout and Gee Bee. Among Namco's first major hits was the fixed shooter Galaxian in 1979
and Pac-Man in 1980. During the golden age of arcade video games in the early 1980s, Namco released titles such as Galaga, Xevious, and Pole Position. Namco entered the home market in 1984 with conversions of its arcade games. Namco produced several multi-million-selling game franchises, such as Pac-Man, Galaxian, Tekken, Tales, Ridge
Racer, Ace Combat, and Taiko no Tatsujin. In 2006, Namco merged with Bandai to form Bandai Namco Holdings. (Fullarticle...)Recently featured: The Boat Race 2018Radar, Gun Laying, Mk.I and Mk.IIAndrea NavageroArchiveBy emailMore featured articlesAboutSylvilagus aquaticus... that the swamp rabbit (pictured) is both territorial and a great
swimmer?... that no other month in a calendar year starts with the same day of the week as June?... that Samantha Kane led an unsuccessful takeover bid for Sheffield United F.C. and, after a gender transition, was interviewed to become its chief executive?... that the first version of the Amtrak Susquehanna River Bridge was heavily damaged by a
tornado during construction?... that medicine dean Sjahriar Rasad was accused of being involved in a conspiracy to assassinate Indonesian President Sukarno?... that the U.S. Supreme Court is currently deciding whether the family who lived in a house wrongly raided by the FBI may sue the government?... that Romanian sports shooter Petre Cimigiu
demanded the elimination of a pension gap between Olympic and non-Olympic champions, such as himself?... that the novel Looking Glass Girl was launched at Coventry Central Library to highlight the threat of 17 libraries in the city closing?... that John P. Morris won a strike by hiding pigeons in fur coats?ArchiveStart a new articleNominate an
articleNgg wa Thiong'oKenyan writer and activist Ngg wa Thiong'o (pictured) dies at the age of 87.In sumo, nosato Daiki is promoted to yokozuna.In association football, Liverpool win the Premier League title.In the Surinamese general election, the National Democratic Party wins the most seats in the National Assembly.In motor racing, lex Palou
wins the Indianapolis 500.Ongoing: Gaza warM23 campaignRussian invasion of UkrainetimelineSudanese civil wartimelineRecent deaths: Harrison Ruffin TylerPhil RobertsonMary K. GaillardPeter DavidAlan YentobGerry ConnollyNominate an articleJune 1Wreckage of American Airlines Flight 14201676 Scanian War: The Swedish warship Kronan,
one of the largest ships in the world at the time, sank at the Battle of land with the loss of around 800 men.1857 The Revolution of the Ganhadores, the first general strike in Brazil, began in Salvador, Bahia.1974 In an informal article in a medical journal, Henry Heimlich introduced the concept of abdominal thrusts, commonly known as the Heimlich
maneuver, to treat victims of choking.1988 Group representation constituencies were introduced to the parliament of Singapore.1999 On landing at Little Rock National Airport in the U.S. state of Arkansas, American Airlines Flight 1420 overran the runway and crashed (wreckage pictured), resulting in 11 deaths.Kitabatake Chikafusa (d.1354)Louisa
Caroline Tuthill (d.1879)Tom Holland (b.1996)Faizul Waheed (d.2021)More anniversaries: May 31June 1June 2ArchiveBy emailList of days of the yearAboutDrosera capensis, commonly known as the Cape sundew, is a perennial rosette-forming carnivorous plant in the family Droseraceae. It is endemic to the Western Cape and Eastern Cape provinces
of South Africa. As in all sundews, the leaves are covered in stalked, mucilage-secreting glands (or 'tentacles') that attract, trap, and digest arthropod prey. When prey is captured, the tentacles bend inward and the leaves curl around it, preventing escape and enhancing digestion by increasing the surface area of the leaf in contact with the prey. This
time-lapse video shows a D.capensis leaf curling up around a Mediterranean fruit fly over a period of approximately six hours.Video credit: Scott SchillerRecently featured: Cucumis metuliferusIgnace TonenAustralian white ibisArchiveMore featured picturesCommunity portal The central hub for editors, with resources, links, tasks, and
announcements.Village pump Forum for discussions about Wikipedia itself, including policies and technical issues.Site news Sources of news about Wikipedia and the broader Wikimedia movement.Teahouse Ask basic questions about using or editing Wikipedia.Help desk Ask questions about using or editing Wikipedia.Reference desk Ask research
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Many other Wikipedias are available; some of the largest are listed below. 1,000,000+ articles DeutschEspaolFranaisItalianoNederlandsPolskiPortugusSvenskaTing Vit 250,000+ articles Bahasa IndonesiaBahasa MelayuBn-lm-gCataletinaDanskEestiEsperantoEuskaraMagyarNorsk bokmlRomnSimple
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may be challenged and removed.Find sources:"1676"news newspapers books scholar JSTOR (September 2017) (Learn how and when to remove this message)Calendar yearYearsMillennium2ndmillenniumCenturies16thcentury17thcentury 18thcenturyDecades1650s1660s1670s 1680s1690sYears1673167416751676 167716781679vteSeptember 19:
Virginian rebels commanded by Nathaniel Bacon burn down Jamestown, Virginia during war against British governor.1676 by topicArts and scienceArchitectureArtLiteratureMusicScienceLeadersState leadersColonial governorsReligious leadersBirth and death categoriesBirths DeathsEstablishments and disestablishments categoriesEstablishments
DisestablishmentsWorks categoryWorksvte1676 in various calendarsGregorian calendar1676MDCLXXVIAb urbe condita2429Armenian calendar1125 Assyrian calendar6426Balinese saka calendar15971598Bengali calendar10821083Berber calendar2626English Regnal year27Cha.228Cha.2Buddhist calendar2220Burmese calendar1038Byzantine
calendar71847185Chinese calendar (WoodRabbit)4373 or 4166to (FireDragon)4374 or 4167Coptic calendar13921393Discordian calendar2842Ethiopian calendar16681669Hebrew calendar54365437Hindu calendars- Vikram Samvat17321733- Shaka Samvat15971598- Kali Yuga47764777Holocene calendar11676Igbo calendar676677Iranian
calendar10541055Islamic calendar10861087Japanese calendarEnp 4()Javanese calendar15981599Julian calendarGregorian minus 10 daysKorean calendar4009Minguo calendar236 before ROC236Nanakshahi calendar208Thai solar calendar22182219Tibetan calendar(female Wood-Rabbit)1802 or 1421 or 649to(male Fire-Dragon)1803 or 1422 or
650August 17: Sweden defeats Denmark-Norway in Battle of Halmstad.1676 (MDCLXXVI) was a leap year starting on Wednesday of the Gregorian calendarand a leap year starting on Saturday of the Julian calendar, the 1676th year of the Common Era (CE) and Anno Domini (AD) designations, the 676th year of the 2ndmillennium, the 76th year of the
17thcentury, and the 7th year of the 1670s decade. As of the start of 1676, the Gregorian calendar was 10 days ahead of the Julian calendar, which remained in localized use until 1923. Calendar year December 4: Battle of LundJanuary 29 Feodor III becomes Tsar of Russia.January 31 Universidad de San Carlos de Guatemala, the oldest institution of
higher education in Central America, is founded.[1]January Six months into King Philip's War, Metacomet (King Philip), leader of the Algonquian tribe known as the Wampanoag, travels westward to the Mohawk nation, seeking an alliance with the Mohawks against the English colonists of New England; his efforts in creating such an alliance are a
failure.February 10 After the Nipmuc tribe attacks Lancaster, Massachusetts, colonist Mary Rowlandson is taken captive, and lives with the Indians until May.February 14 Metacomet and his Wampanoags attack Northampton, Massachusetts; meanwhile, the Massachusetts Council debates whether a wall should be erected around Boston.February 23
While the Massachusetts Council debates how to handle the Christian Indians they had exiled to Deer Island on October 13, 1675, a coalition of Indians led by Metacomet attacks colonial settlements just 16km (9.9mi) outside of Boston.March 29 Providence, Rhode Island is attacked and destroyed by Native Americans.April 2 Chief Canonchet of the
Narragansett people is captured by mercenaries of the Pequot, Mohegan and Niantic nations who have been hired by English settlers. He is offered a chance to live if he makes peace with the English, refuses, and is executed the next day in Stonington, Connecticut.April 12 Richard Raynsford becomes the new Lord Chief Justice of England and
Wales.April 21 Sudbury Fight: The village of Sudbury, Massachusetts is attacked by Metacom's Wampanoag Confederation as one of the last major battles of King Phillip's War. Captain Samuel Wadworth and 28 of his men are killed in the defense of the town.April 22 The Battle of Augusta is fought in the Mediterranean Sea off of the coast of Sicily
during the Franco-Dutch War. The French Navy and the combined Dutch Republic and Spanish forces each lose over 500 men.May 2 Mary Rowlandson is ransomed from captivity by Native Americans by a subscription raised by women of Boston.May 19 Peskeomskut Massacre: Battle of Turner's Falls Captain William Turner leads a raid at first light
on an encampment consisting mainly of women and children. An estimated 300-400 lives are taken in less than half an hour, first from gunshot directly into the sleeping tents, then by sword and by drowning as the victims try to flee. This incident happens on the west bank of the Connecticut River, just above the falls known as Turner's Falls in Gill,
Massachusetts.May 26 A fire destroys the town hall and 624 houses in Southwark, London.[2]May 31 The Massachusetts Council finally decides to move the Christian Indians from Deer Island to Cambridge, Massachusetts (approximate date).June 1 Scanian War: Battle of land A combined fleet of the Dutch Republic and DenmarkNorway decisively
defeats the Swedish Navy, which loses its flagship Kronan.June 12 The Indian coalition attacks Hadley, Massachusetts, but are repelled by Connecticut troops.June 19 Massachusetts issues a declaration of amnesty to any Indian who surrenders.June Bacon's Rebellion begins in the Virginia Colony. On July 30, Nathaniel Bacon and his followers issue
the Declaration of the People of Virginia.July 2 Major John Talcott and his troops begin sweeping Connecticut and Rhode Island, capturing large numbers of Native Americans from Algonquian tribes and exporting them out of the English colonies as slaves.July 4 Captain Benjamin Church and his soldiers begin sweeping Plymouth Colony, for any
remaining Wampanoag tribesmen.July 11 The Wampanoags attack Taunton, Massachusetts, but are repelled by colonists.July 17 In France, Madame de Brinvilliers is executed for poisoning her father and brothers. The case also scares King Louis XIV into starting a series of investigations about possible poisonings and witchcraft (later called the
Affair of the Poisons).July 27 Nearly 200 Nipmuc tribesmen surrender to the English colonists in Boston.July 30 Virginia colonist Nathaniel Bacon and his makeshift army issue a Declaration of the People of Virginia, instigating Bacon's Rebellion against the rule of Governor William Berkeley.August 2 Captain Benjamin Church captures Metacomet's
wife and son.August 12 King Philip (Metacomet), chief of the Wampanoags that had waged a war throughout southern New England that bore his name, is killed by an Indian named Alderman, a soldier led by Captain Benjamin Church.August 17 Battle of Halmstad (fought at Fyllebro): Sweden gains a decisive victory over DenmarkNorway.August 28
The Irish Donation of 1676 is shipped from Dublin, to relieve Boston in the Massachusetts Bay Colony.September 19The Russo-Turkish War (16761681) begins, with Russo-Ukrainian troops forcing pro-Ottoman Hetman Ivan Samoylovych to surrender Chyhyryn.Bacon's Rebellion: Jamestown is burned to the ground by the forces of Nathaniel
Bacon.September 21 Pope Innocent XI succeeds Pope Clement X, as the 240th Pope of the Roman Catholic Church.October 13 Battle of Gegodog: Trunajaya defeats the Mataram Sultanate.October 17 The Treaty of urawno is signed, between the Ottoman (Turkish) Empire and PolishLithuanian Commonwealth.November 16 A prison is founded on
Nantucket Island, in the English colony of Massachusetts.November 27 A fire in Boston, Massachusetts, is accidentally set by a careless and sleepy apprentice, who drops a lighted candle, or leaves it too near some combustible substance; this is the largest fire known at this time in the district. The Rev. Increase Mathers church, dwelling and a
portion of his personal library are destroyed.[3]December 4 Scanian War Battle of Lund: Sweden defeats the forces of Denmark.December 7 Ole Rmer makes the first quantitative measurements of the speed of light.December 21 Sands baronets created in the Baronetage of Ireland.[4]Emperor Yohannes I of Ethiopia decrees that Muslims must live
separately from Christians throughout his realm.Anton van Leeuwenhoek discovers microorganisms.An bo Lantdag (assembly) meets in Turku, Finland.The French East India Company founds its principal Indian base at Pondicherry, on the Coromandel Coast.The first coffeehouse in North America opens in Boston.[5]Robert WalpoleMarch 17 Thomas
Boston, Scottish church leader (d. 1732)March 27 Francis II Rkczi, Hungarian rebel against the Habsburgs (d. 1735)April 23 King Frederick I of Sweden (d. 1751)May 26 Maria Clara Eimmart, German astronomer, engraver and designer (d. 1707)May 28 Jacopo Riccati, Italian mathematician (d. 1754)June 17 Louise de Maisonblanche, illegitimate
daughter of Louis XIV of France (d. 1718)June 21 Anthony Collins, English philosopher (d. 1729)July 3 Leopold I, Prince of Anhalt-Dessau, Prussian field marshal (d. 1747)July 14 Caspar Abel, German theologian, historian, poet (d. 1763)August 26 Robert Walpole, first Prime Minister of the United Kingdom (d. 1745)[6]September 13 lisabeth Charlotte
d'Orlans, duchess and regent of Lorraine (d. 1744)September 18 Eberhard Louis, Duke of Wrttemberg (d. 1733)October 8 Benito Jernimo Feijo y Montenegro, Spanish scholar (d. 1764)October 19 Rodrigo Anes de S Almeida e Meneses, 1st Marquis of Abrantes, Portuguese diplomat (d. 1733)November 8 Louise Bndicte de Bourbon, duchess of Maine,
daughter in law of Louis XIV (d.1753)date unknown Alexander Selkirk, Scottish sailor (d. 1721)John ClarkeMichiel de RuyterMatthew HaleJanuary 7 Marco Faustini, Italian opera manager (b. 1606)January 13 Isaac Commelin, Dutch historian (b. 1598)January 14 Francesco Cavalli, Italian composer (b. 1602)January 16 Georg Arnold, Austrian musician
(b. 1621)January 29 Tsar Alexis of Russia (b. 1629)February 3 Franois Chauveau, French painter (b. 1613)February 14 Abraham Bosse, French engraver and artist (b. c. 1604)February 20 Hugh Forth, English politician (b. 1610)March 2 Juan de Almoguera, Roman Catholic prelate who served as Archbishop of Lima (16731676) and Bishop of Arequipa
(16591673) (b. 1605)March 21 Henri Sauval, French historian (b. 1623)March 22 Lady Anne Clifford, 14th Baroness de Clifford (b. 1590)March 23 Paul Wrtz, Swedish general (b. 1612)March 27 Bernardino de Rebolledo, Spanish poet, soldier and diplomat (b. 1597)April 5 John Winthrop the Younger, Governor of Connecticut (b. 1606)April 8 Claudia
Felicitas of Austria, Holy Roman Empress (b. 1653)April 20 John Clarke, English physician (b. 1609)April 29 Michiel de Ruyter, Dutch admiral (b. 1607)May 5 Sir Richard Lloyd, English politician (b. 1606)May 7 Henri Valois, French historian (b. 1603)May 25 Johann Rahn, Swiss mathematician (b. 1622)May 26 Thomas Rouse, English politician (b.
1608)June 1 Karl Kaspar von der Leyen, German Catholic archbishop (b. 1618)June 7 Paul Gerhardt, German hymnist (b. 1606)June 13 Princess Henriette Adelaide of Savoy, wife of Ferdinand Maria (b. 1636)June 16 Nathaniel Dickinson, American settler (b. 1601)June 29 Hendrik van der Borcht II, German painter (b. 1614)July Jesse Wharton colonial
governor of MarylandJuly 5 Carl Gustaf Wrangel, Swedish soldier (b. 1613)July 8 Francis I Rkczi, Hungarian prince of Transylvania (b. 1645)July 12 Duchess Elisabeth Sophie of Mecklenburg, German poet composer and (by marriage) Duchess of Brunswick-Lneburg (b. 1613)July 22 Pope Clement X (b. 1590)July 25 Franois Hdelin, abb d'Aubignac,
French writer (b. 1604)July 17 Madame de Brinvilliers, French murderer (b. 1630)August 11 Hans Jakob Christoffel von Grimmelshausen, German writer (b. 1621)August 14 Nicol Sagredo, 105th Doge of Venice (b. 1606)August 28 Margravine Louise Charlotte of Brandenburg, Duchess of Courland by marriage (16451676) (b. 1617)August 31 Lars
Stigzelius, Swedish Lutheran archbishop (b. 1598)September 4 John Ogilby, Scottish-born impresario and cartographer active in Dublin and London (b. 1600)September 9 Paul de Chomedey, Sieur de Maisonneuve, French military officer, founder of Montreal in New France (b. 1612)September 10 Gerrard Winstanley, English religious reformer (b.
1609)September 11 Anna de' Medici, Archduchess of Austria (b. 1616)September 17 Sabbatai Zevi, Montenegrin rabbi, kabbalist and founder of the Jewish Sabbatean movement (b. 1626)September 28 Anna Maria Antig, Spanish Catholic nun (b. 1602)October 6 Claudia Rusca, Italian composer, singer, and organist (b. 1593)October 7 Richard Neville,
English soldier and MP (b. 1615)October 10 Sebastian Knpfer, German composer (b. 1633)October 13 Juan de Arellano, Spanish artist (b. 1614)October 15 Simon de Vos, Flemish painter (b. 1603)October 26 Nathaniel Bacon, Virginian colonist and instigator of Bacon's Rebellion (b. circa 1640s)October 28 Jean Desmarets, French writer (b.
1595)November 1 Gisbertus Voetius, Dutch theologian (b. 1589)November 9 Allart Pieter van Jongestall, Dutch jurist, politician, and diplomat (b. 1612)November 12 Shang Kexi, Chinese general (b. 1604)December 11 Roland Frart de Chambray, French writer (b. 1606)December 12 William Morice, English politician (b. 1602)December 18 Edward
Benlowes, English poet (b. 1603)December 19 Adolph, Prince of Nassau-Schaumburg and Count of Nassau-Schaumburg (16531676) (b. 1629)December 25Matthew Hale, Lord Chief Justice of England (b. 1609)William Cavendish, 1st Duke of Newcastle-upon-Tyne, English soldier, politician, writer (b. 1592)^ Procedure 373 of the Guatemalan Real
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world map by the Italian Amerigo Vespucci (from whose name the word America is derived) and Belgian Gerardus Mercator shows (besides the classical continents Europe, Africa, and Asia) the Americas as America sive India Nova', New Guinea, and other islands of Southeast Asia, as well as a hypothetical Arctic continent and a yet undetermined
Terra Australis.[1]The 16th century began with the Julian year 1501 (represented by the Roman numerals MDI) and ended with either the Julian or the Gregorian year 1600 (MDC), depending on the reckoning used (the Gregorian calendar introduced a lapse of 10 days in October 1582).[1]The Renaissance in Italy and Europe saw the emergence of
important artists, authors and scientists, and led to the foundation of important subjects which include accounting and political science. Copernicus proposed the heliocentric universe, which was met with strong resistance, and Tycho Brahe refuted the theory of celestial spheres through observational measurement of the 1572 appearance of a Milky
Way supernova. These events directly challenged the long-held notion of an immutable universe supported by Ptolemy and Aristotle, and led to major revolutions in astronomy and science. Galileo Galilei became a champion of the new sciences, invented the first thermometer and made substantial contributions in the fields of physics and astronomy,
becoming a major figure in the Scientific Revolution in Europe.Spain and Portugal colonized large parts of Central and South America, followed by France and England in Northern America and the Lesser Antilles. The Portuguese became the masters of trade between Brazil, the coasts of Africa, and their possessions in the Indies, whereas the Spanish
came to dominate the Greater Antilles, Mexico, Peru, and opened trade across the Pacific Ocean, linking the Americas with the Indies. English and French privateers began to practice persistent theft of Spanish and Portuguese treasures. This era of colonialism established mercantilism as the leading school of economic thought, where the economic
system was viewed as a zero-sum game in which any gain by one party required a loss by another. The mercantilist doctrine encouraged the many intra-European wars of the period and arguably fueled European expansion and imperialism throughout the world until the 19th century or early 20th century.The Reformation in central and northern
Europe gave a major blow to the authority of the papacy and the Catholic Church. In England, the British-Italian Alberico Gentili wrote the first book on public international law and divided secularism from canon law and Catholic theology. European politics became dominated by religious conflicts, with the groundwork for the epochal Thirty Years'
War being laid towards the end of the century.In the Middle East, the Ottoman Empire continued to expand, with the sultan taking the title of caliph, while dealing with a resurgent Persia. Iran and Iraq were caught by a major popularity of the Shia sect of Islam under the rule of the Safavid dynasty of warrior-mystics, providing grounds for a Persia
independent of the majority-Sunni Muslim world.[2]In the Indian subcontinent, following the defeat of the Delhi Sultanate and Vijayanagara Empire, new powers emerged, the Sur Empire founded by Sher Shah Suri, Deccan sultanates, Rajput states, and the Mughal Empire[3] by Emperor Babur, a direct descendant of Timur and Genghis Khan.[4] His
successors Humayun and Akbar, enlarged the empire to include most of South Asia.Japan suffered a severe civil war at this time, known as the Sengoku period, and emerged from it as a unified nation under Toyotomi Hideyoshi. China was ruled by the Ming dynasty, which was becoming increasingly isolationist, coming into conflict with Japan over
the control of Korea as well as Japanese pirates.In Africa, Christianity had begun to spread in Central Africa and Southern Africa. Until the Scramble for Africa in the late 19th century, most of Africa was left uncolonized.For timelines of earlier events, see 15th century and Timeline of the Middle Ages.Mona Lisa, by Leonardo da Vinci, c.15031506, one
of the world's best-known paintings1501: Michelangelo returns to his native Florence to begin work on the statue David.1501: Safavid dynasty reunifies Iran and rules over it until 1736. Safavids adopt a Shia branch of Islam.[5]1501: First Battle of Cannanore between the Third Portuguese Armada and Kingdom of Cochin under Joo da Nova and
Zamorin of Kozhikode's navy marks the beginning of Portuguese conflicts in the Indian Ocean.1502: First reported African slaves in the New World1502: The Crimean Khanate sacks Sarai in the Golden Horde, ending its existence.1503: Spain defeats France at the Battle of Cerignola. Considered to be the first battle in history won by gunpowder small
arms.1503: Leonardo da Vinci begins painting the Mona Lisa and completes it three years later.1503: Nostradamus is born on either December 14 or December 21.1504: A period of drought, with famine in all of Spain.1504: Death of Isabella I of Castile; Joanna of Castile becomes the Queen.1504: Foundation of the Sultanate of Sennar by Amara
Dunqas, in what is modern Sudan1505: Zhengde Emperor ascends the throne of Ming dynasty.1505: Martin Luther enters St. Augustine's Monastery at Erfurt, Germany, on 17 July and begins his journey to instigating the Reformation.1505: Sultan Trenggono builds the first Muslim kingdom in Java, called Demak, in Indonesia. Many other small
kingdoms were established in other islands to fight against Portuguese. Each kingdom introduced local language as a way of communication and unity.1506: Leonardo da Vinci completes the Mona Lisa.1506: King Afonso I of Kongo wins the battle of Mbanza Kongo, resulting in Catholicism becoming Kongo's state religion.Battle of Cerignola: El Gran
Capitan finds the corpse of Louis d'Armagnac, Duke of Nemours1506: At least two thousand converted Jews are massacred in a Lisbon riot, Portugal.1506: Christopher Columbus dies in Valladolid, Spain.1506: Poland is invaded by Tatars from the Crimean Khanate.1507: The first recorded epidemic of smallpox in the New World on the island of
Hispaniola. It devastates the native Tano population.[6]1507: Afonso de Albuquerque conquered Hormuz and Muscat, among other bases in the Persian Gulf, taking control of the region at the entrance of the Gulf.1508: The Christian-Islamic power struggle in Europe and West Asia spills over into the Indian Ocean as Battle of Chaul during the
Portuguese-Mamluk War15081512: Michelangelo paints the Sistine Chapel ceiling.1509: The defeat of joint fleet of the Sultan of Gujarat, the Mamlk Burji Sultanate of Egypt, and the Zamorin of Calicut with support of the Republic of Venice and the Ottoman Empire in Battle of Diu marks the beginning of Portuguese dominance of the Spice trade and
the Indian Ocean.1509: The Portuguese king sends Diogo Lopes de Sequeira to find Malacca, the eastern terminus of Asian trade. After initially receiving Sequeira, Sultan Mahmud Shah captures and/or kills several of his men and attempts an assault on the four Portuguese ships, which escape.[7] The Javanese fleet is also destroyed in Malacca.1509:
Krishnadevaraya ascends the throne of Vijayanagara Empire.Afonso de Albuquerque15091510: The 'great plague' in various parts of Tudor England.[8]1510: Afonso de Albuquerque of Portugal conquers Goa in India.1511: Afonso de Albuquerque of Portugal conquers Malacca, the capital of the Sultanate of Malacca in present-day Malaysia.1512:
Copernicus writes Commentariolus, and proclaims the Sun the center of the Solar System.1512: The southern part (historical core) of the Kingdom of Navarre is invaded by Castile and Aragon.1512: Qutb Shahi dynasty, founded by Quli Qutb Mulk, rules Golconda Sultanate until 1687.1512: The first Portuguese exploratory expedition was sent
eastward from Malacca (in present-day Malaysia) to search for the 'Spice Islands' (Maluku) led by Francisco Serro. Serro is shipwrecked but struggles on to Hitu (northern Ambon) and wins the favour of the local rulers.[9]1513: Machiavelli writes The Prince, a treatise about political philosophy1513: The Portuguese mariner Jorge lvares lands at
Macau, China, during the Ming dynasty.1513: Henry VIII defeats the French at the Battle of the Spurs.1513: The Battle of Flodden Field in which invading Scots are defeated by Henry VIII's forces.1513: Sultan Selim I ("The Grim") orders the massacre of Shia Muslims in Anatolia (present-day Turkey).1513: Vasco Nez de Balboa, in service of Spain
arrives at the Pacific Ocean (which he called Mar del Sur) across the Isthmus of Panama. He was the first European to do so.1514: The Battle of Orsha halts Muscovy's expansion into Eastern Europe.1514: Dzsa rebellion (peasant revolt) in Hungary.Martin Luther initiated the Reformation with his Ninety-five Theses in 1517.1514: The Battle of
Chaldiran, the Ottoman Empire gains decisive victory against Safavid dynasty.1515: Ascension of Francis I of France as King of France following the death of Louis XII.1515: The Ottoman Empire wrests Eastern Anatolia from the Safavids after the Battle of Chaldiran.1515: The Ottomans conquer the last beyliks of Anatolia, the Dulkadirs and the
Ramadanids.15161517: The Ottomans defeat the Mamluks and gain control of Egypt, Arabia, and the Levant.1517: The Sweating sickness epidemic in Tudor England.[10]1517: The Reformation begins when Martin Luther posts his Ninety-five Theses in Saxony.1518: The Treaty of London was a non-aggression pact between the major European
nations. The signatories were Burgundy, France, England, the Holy Roman Empire, the Netherlands, the Papal States and Spain, all of whom agreed not to attack one another and to come to the aid of any that were under attack.1518: Mir Chakar Khan Rind leaves Baluchistan and settles in Punjab.1518: Leo Africanus, also known as al-Hasan ibn
Muhammad al-Wazzan al-Fasi, an Andalusian Berber diplomat who is best known for his book Descrittione dellAfrica (Description of Africa), is captured by Spanish pirates; he is taken to Rome and presented to Pope Leo X.1518: The dancing plague of 1518 begins in Strasbourg, lasting for about one month.1519: Leonardo da Vinci dies of natural
causes on May 2.Europe at the time of the accession of Charles V in 15191519: Wang Yangming, the Chinese philosopher and governor of Jiangxi province, describes his intent to use the firepower of the fo-lang-ji, a breech-loading Portuguese culverin, in order to suppress the rebellion of Prince Zhu Chenhao.1519: Barbary pirates led by Hayreddin
Barbarossa, a Turk appointed to ruling position in Algiers by the Ottoman Empire, raid Provence and Toulon in southern France.1519: Death of Emperor Maximilian; Charles I of Austria, Spain, and the Low Countries becomes Emperor of Holy Roman Empire as Charles V, Holy Roman Emperor (ruled until 1556).15191522: Spanish expedition
commanded by Magellan and Elcano are the first to Circumnavigate the Earth.15191521: Hernn Corts leads the Spanish conquest of the Aztec Empire.Ferdinand Magellan led the first expedition that circumnavigated the globe in 15191522.15201566: The reign of Suleiman the Magnificent marks the zenith of the Ottoman Empire.1520: The first
European diplomatic mission to Ethiopia, sent by the Portuguese, arrives at Massawa 9 April, and reaches the imperial encampment of Emperor Dawit II in Shewa 9 October.1520: Vijayanagara Empire forces under Krishnadevaraya defeat the Adil Shahi under at the Battle of Raichur1520: Sultan Ali Mughayat Shah of Aceh begins an expansionist
campaign capturing Daya on the west Sumatran coast (in present-day Indonesia), and the pepper and gold producing lands on the east coast.1520: The Portuguese established a trading post in the village of Lamakera on the eastern side of Solor (in present-day Indonesia) as a transit harbour between Maluku and Malacca.1521: Belgrade (in present-
day Serbia) is captured by the Ottoman Empire.1521: After building fortifications at Tuen Mun, the Portuguese attempt to invade Ming dynasty China, but are expelled by Chinese naval forces.1521: Philippines encountered by Ferdinand Magellan. He was later killed in the Battle of Mactan in central Philippines in the same year.1521: Jiajing Emperor
ascended the throne of Ming dynasty, China.1521: November, Ferdinand Magellan's expedition reaches Maluku (in present-day Indonesia) and after trade with Ternate returns to Europe with a load of cloves.1521: Pati Unus leads the invasion of Malacca (in present-day Malaysia) against the Portuguese occupation. Pati Unus was killed in this battle,
and was succeeded by his brother, sultan Trenggana.1522: Rhodes falls to the Ottomans of Suleiman the Magnificent.[11]Sack of Rome of 1527 by Charles V's forces (painting by Johannes Lingelbach)1522: The Portuguese ally themselves with the rulers of Ternate (in present-day Indonesia) and begin construction of a fort.[9]1522: August, Luso-
Sundanese Treaty signed between Portugal and Sunda Kingdom granted Portuguese permit to build fortress in Sunda Kelapa.1523: Sweden gains independence from the Kalmar Union.1523: The Cacao bean is introduced to Spain by Hernn Corts15241525: German Peasants' War in the Holy Roman Empire.1524: Giovanni da Verrazzano is the first
European to explore the Atlantic coast of North America between South Carolina and Newfoundland.1524: Ismail I, the founder of Safavid dynasty, dies and Tahmasp I becomes king.Gun-wielding Ottoman Janissaries and defending Knights of Saint John at the siege of Rhodes in 1522, from an Ottoman manuscript1525: Timurid Empire forces under
Babur defeat the Lodi dynasty at the First Battle of Panipat, end of the Delhi Sultanate.1525: German and Spanish forces defeat France at the Battle of Pavia, Francis I of France is captured.1526: The Ottomans defeat the Kingdom of Hungary at the Battle of Mohcs.1526: Mughal Empire, founded by Babur.1527: Sack of Rome with Pope Clement VII
escaping and the Swiss Guards defending the Vatican being killed. The sack of the city of Rome considered the end of the Italian Renaissance.1527: Protestant Reformation begins in Sweden.1527: The last ruler of Majapahit falls from power. This state (located in present-day Indonesia) was finally extinguished at the hands of the Demak. A large
number of courtiers, artisans, priests, and members of the royalty moved east to the island of Bali; however, the power and the seat of government transferred to Demak under the leadership of Pangeran, later Sultan Fatah.1527: June 22, The Javanese Prince Fatahillah of the Cirebon Sultanate successfully defeated the Portuguese armed forces at the
site of the Sunda Kelapa Harbor. The city was then renamed Jayakarta, meaning "a glorious victory." This eventful day came to be acknowledged as Jakarta's Founding Anniversary.1527: Mughal Empire forces defeat the Rajput led by Rana Sanga of Mewar at the Battle of Khanwa1529: The Austrians defeat the Ottoman Empire at the siege of
Vienna.1529: Treaty of Zaragoza defined the antimeridian of Tordesillas attributing the Moluccas to Portugal and Philippines to Spain.1529: Imam Ahmad Gurey defeats the Ethiopian Emperor Dawit II in the Battle of Shimbra Kure, the opening clash of the EthiopianAdal War.Spanish conquistadors with their Tlaxcallan allies fighting against the
Otomies of Metztitlan in present-day Mexico, a 16th-century codex15311532: The Church of England breaks away from the Catholic Church and recognizes King Henry VIII as the head of the Church.1531: The Inca Civil War is fought between the two brothers, Atahualpa and Huscar.1532: Francisco Pizarro leads the Spanish conquest of the Inca
Empire.1532: Foundation of So Vicente, the first permanent Portuguese settlement in the Americas.1533: Anne Boleyn becomes Queen of England.1533: Elizabeth Tudor is born.1534: Jacques Cartier claims Canada for France.1534: The Ottomans capture Baghdad from the Safavids.1534: Affair of the Placards, where King Francis I becomes more
active in repression of French Protestants.1535: The Mnster Rebellion, an attempt of radical, millennialist, Anabaptists to establish a theocracy, ends in bloodshed.1535: The Portuguese in Ternate depose Sultan Tabariji (or Tabarija) and send him to Portuguese Goa where he converts to Christianity and bequeaths his Portuguese godfather Jordao de
Freitas the island of Ambon.[12] Hairun becomes the next sultan.1536: Catherine of Aragon dies in Kimbolton Castle, in England.Territorial expansion of the Ottoman Empire under Suleiman (in red and orange)1536: In England, Anne Boleyn is beheaded for adultery and treason.1536: Establishment of the Inquisition in Portugal.1536: Foundation of
Buenos Aires (in present-day Argentina) by Pedro de Mendoza.1537: The Portuguese establish Recife in Pernambuco, north-east of Brazil.1537: William Tyndale's partial translation of the Bible into English is published, which would eventually be incorporated into the King James Bible.1538: Gonzalo Jimnez de Quesada founds Bogot.1538:
SpanishVenetian fleet is defeated by the Ottoman Turks at the Battle of Preveza.1539: Hernando de Soto explores inland North America.Nicolaus Copernicus1540: The Society of Jesus, or the Jesuits, is founded by Ignatius of Loyola and six companions with the approval of Pope Paul III.1540: Sher Shah Suri founds the Suri dynasty in South Asia, an
ethnic Pashtun (Pathan) of the house of Sur, who supplanted the Mughal dynasty as rulers of North India during the reign of the relatively ineffectual second Mughal emperor Humayun. Sher Shah Suri decisively defeats Humayun in the Battle of Bilgram (May 17, 1540).1541: Pedro de Valdivia founds Santiago in Chile.1541: An Algerian military
campaign by Charles V of Spain (Habsburg) is unsuccessful.1541: Amazon River is encountered and explored by Francisco de Orellana.1541: Capture of Buda and the absorption of the major part of Hungary by the Ottoman Empire.1541: Sahib I Giray of Crimea invades Russia.1542: The Italian War of 15421546 War resumes between Francis I of
France and Emperor Charles V. This time Henry VIII is allied with the Emperor, while James V of Scotland and Sultan Suleiman I are allied with the French.1542: Akbar The Great is born in the Rajput Umarkot Fort1542: Spanish explorer Ruy Lpez de Villalobos named the island of Samar and Leyte Las Islas Filipinas honoring Philip II of Spain and
became the official name of the archipelago.1543: Ethiopian/Portuguese troops defeat the Adal army led by Imam Ahmad Gurey at the Battle of Wayna Daga; Imam Ahmad Gurey is killed at this battle.1543: Copernicus publishes his theory that the Earth and the other planets revolve around the Sun1543: The Nanban trade period begins after
Portuguese traders make contact with Japan.1544: The French defeat an ImperialSpanish army at the Battle of Ceresole.Scenes of everyday life in Ming China, by Qiu Ying1544: Battle of the Shirts in Scotland. The Frasers and Macdonalds of Clan Ranald fight over a disputed chiefship; reportedly, 5 Frasers and 8 Macdonalds survive.1545: Songhai
forces sack the Malian capital of Niani1545: The Council of Trent meets for the first time in Trent (in northern Italy).1546: Michelangelo Buonarroti is made chief architect of St. Peter's Basilica.1546: Francis Xavier works among the peoples of Ambon, Ternate and Morotai (Moro) laying the foundations for a permanent mission. (to 1547)1547: Henry
VIII dies in the Palace of Whitehall on 28 January at the age of 55.1547: Francis I dies in the Chteau de Rambouillet on 31 March at the age of 52.1547: Edward VI becomes King of England and Ireland on 28 January and is crowned on 20 February at the age of 9.1547: Emperor Charles V decisively dismantles the Schmalkaldic League at the Battle of
Mhlberg.1547: Grand Prince Ivan the Terrible is crowned tsar of (All) Russia, thenceforth becoming the first Russian tsar.1548: Battle of Uedahara: Firearms are used for the first time on the battlefield in Japan, and Takeda Shingen is defeated by Murakami Yoshikiyo.1548: Askia Daoud, who reigned from 1548 to 1583, establishes public libraries in
Timbuktu (in present-day Mali).1548: The Ming dynasty government of China issues a decree banning all foreign trade and closes down all seaports along the coast; these Hai jin laws came during the Wokou wars with Japanese pirates.1549: Tom de Sousa establishes Salvador in Bahia, north-east of Brazil.1549: Arya Penangsang with the support of
his teacher, Sunan Kudus, avenges the death of Raden Kikin by sending an envoy named Rangkud to kill Sunan Prawoto by Keris Kyai Satan Kober (in present-day Indonesia).The Islamic gunpowder empires: Mughal Army artillerymen during the reign of Jalaluddin Akbar1550: The architect Mimar Sinan builds the Sleymaniye Mosque in
Istanbul.1550: Mongols led by Altan Khan invade China and besiege Beijing.15501551: Valladolid debate concerning the human rights of the Indigenous people of the Americas.1551: Fifth outbreak of sweating sickness in England. John Caius of Shrewsbury writes the first full contemporary account of the symptoms of the disease.1551: North African
pirates enslave the entire population of the Maltese island Gozo, between 5,000 and 6,000, sending them to Libya.1552: Russia conquers the Khanate of Kazan in central Asia.1552: Jesuit China Mission, Francis Xavier dies.1553: Mary Tudor becomes the first queen regnant of England and restores the Church of England under Papal authority.1553:
The Portuguese found a settlement at Macau.1554: Missionaries Jos de Anchieta and Manuel da Nbrega establishes So Paulo, southeast Brazil.1554: Princess Elizabeth is imprisoned in the Tower of London upon the orders of Mary I for suspicion of being involved in the Wyatt rebellion.1555: The Muscovy Company is the first major English joint stock
trading company.1556: Publication in Venice of Delle Navigationi et Viaggi (terzo volume) by Giovanni Battista Ramusio, secretary of Council of Ten, with plan La Terra de Hochelaga, an illustration of the Hochelaga.[13]1556: The Shaanxi earthquake in China is history's deadliest known earthquake during the Ming dynasty.1556: Georgius Agricola,
the "Father of Mineralogy", publishes his De re metallica.1556: Akbar defeats Hemu at the Second battle of Panipat.1556: Russia conquers the Astrakhan Khanate.15561605: During his reign, Akbar expands the Mughal Empire in a series of conquests (in the Indian subcontinent).Political map of the world in 15561556: Mir Chakar Khan Rind captures
Delhi with Humayun.1556: Pomponio Algerio, radical theologian, is executed by boiling in oil as part of the Roman Inquisition.1557: Habsburg Spain declares bankruptcy. Philip II of Spain had to declare four state bankruptcies in 1557, 1560, 1575 and 1596.1557: The Portuguese settle in Macau (on the western side of the Pearl River Delta across
from present-day Hong Kong).1557: The Ottomans capture Massawa, all but isolating Ethiopia from the rest of the world.1558: Elizabeth Tudor becomes Queen Elizabeth I at age 25.15581603: The Elizabethan era is considered the height of the English Renaissance.15581583: Livonian War between Poland, Grand Principality of Lithuania, Sweden,
Denmark and Russia.1558: After 200 years, the Kingdom of England loses Calais to France.1559: With the Peace of Cateau Cambrsis, the Italian Wars conclude.1559: Sultan Hairun of Ternate (in present-day Indonesia) protests the Portuguese's Christianisation activities in his lands. Hostilities between Ternate and the Portuguese.The Mughal
Emperor Akbar shoots the Rajput warrior Jaimal during the Siege of Chittorgarh in 15671560: Ottoman navy defeats the Spanish fleet at the Battle of Djerba.1560: Elizabeth Bathory is born in Nyirbator, Hungary.1560: By winning the Battle of Okehazama, Oda Nobunaga becomes one of the pre-eminent warlords of Japan.1560: Jeanne d'Albret
declares Calvinism the official religion of Navarre.1560: Lazarus Church, Macau1561: Sir Francis Bacon is born in London.1561: The fourth battle of Kawanakajima between the Uesugi and Takeda at Hachimanbara takes place.1561: Guido de Bres draws up the Belgic Confession of Protestant faith.1562: Mughal emperor Akbar reconciles the Muslim
and Hindu factions by marrying into the powerful Rajput Hindu caste.15621598: French Wars of Religion between Catholics and Huguenots.1562: Massacre of Wassy and Battle of Dreux in the French Wars of Religion.1562: Portuguese Dominican priests build a palm-trunk fortress which Javanese Muslims burned down the following year. The fort
was rebuilt from more durable materials and the Dominicans commenced the Christianisation of the local population.[12]1563: Plague outbreak claimed 80,000 people in Elizabethan England. In London alone, over 20,000 people died of the disease.1564: Galileo Galilei born on February 151564: William Shakespeare baptized 26 April1565: Deccan
sultanates defeat the Vijayanagara Empire at the Battle of Talikota.1565: Mir Chakar Khan Rind dies at aged 97.1565: Estcio de S establishes Rio de Janeiro in Brazil.1565: The Hospitallers, a Crusading Order, defeat the Ottoman Empire at the siege of Malta (1565).1565: Miguel Lpez de Legazpi establishes in Cebu the first Spanish settlement in the
Philippines starting a period of Spanish colonization that would last over three hundred years.1565: Spanish navigator Andres de Urdaneta discovers the maritime route from Asia to the Americas across the Pacific Ocean, also known as the tornaviaje.1565: Royal Exchange is founded by Thomas Gresham.1566: Suleiman the Magnificent, ruler of the
Ottoman Empire, dies on September 7, during the battle of Szigetvar.Siege of Valenciennes during the Dutch War of Independence in 156715661648: Eighty Years' War between Spain and the Netherlands.1566: Da le Balle Contrade d'Oriente, composed by Cipriano de Rore.1567: After 45 years' reign, Jiajing Emperor died in the Forbidden City,
Longqing Emperor ascended the throne of Ming dynasty.1567: Mary, Queen of Scots, is imprisoned by Elizabeth I.1568: The Transylvanian Diet, under the patronage of the prince John Sigismund Zpolya, the former king of Hungary, inspired by the teachings of Ferenc Dvid, the founder of the Unitarian Church of Transylvania, promulgates the Edict of
Torda, the first law of freedom of religion and of conscience in the World.15681571: Morisco Revolt in Spain.15681600: The Azuchi-Momoyama period in Japan.1568: Hadiwijaya sent his adopted son and son in-law Sutawijaya, who would later become the first ruler of the Mataram dynasty of Indonesia, to kill Arya Penangsang.1569: Rising of the
North in England.1569: Mercator 1569 world map published by Gerardus Mercator.1569: The PolishLithuanian Commonwealth is created with the Union of Lublin which lasts until 1795.1569: Peace treaty signed by Sultan Hairun of Ternate and Governor Lopez De Mesquita of Portugal.The Battle of Lepanto1570: Ivan the Terrible, tsar of Russia,
orders the massacre of inhabitants of Novgorod.1570: Pope Pius V issues Regnans in Excelsis, a papal bull excommunicating all who obeyed Elizabeth I and calling on all Catholics to rebel against her.1570: Sultan Hairun of Ternate (in present-day Indonesia) is killed by the Portuguese.[12] Babullah becomes the next Sultan.1570: 20,000 inhabitants
of Nicosia in Cyprus were massacred and every church, public building, and palace was looted. Cyprus fell to the Ottoman Turks the following year.1571: Pope Pius V completes the Holy League as a united front against the Ottoman Turks, responding to the fall of Cyprus to the Ottomans.1571: The Spanish-led Holy League navy destroys the Ottoman
Empire navy at the Battle of Lepanto.1571: Crimean Tatars attack and sack Moscow, burning everything but the Kremlin.1571: American Indians kill Spanish missionaries in what would later be Jamestown, Virginia.1571: Spanish conquistador Miguel Lpez de Legazpi establishes Manila, Philippines as the capital of the Spanish East Indies.1572:
Brielle is taken from Habsburg Spain by Protestant Watergeuzen in the Capture of Brielle, in the Eighty Years' War.1572: Spanish conquistadores apprehend the last Inca leader Tupak Amaru at Vilcabamba, Peru, and execute him in Cuzco.1572: Jeanne d'Albret dies aged 43 and is succeeded by Henry of Navarre.1572: Catherine de' Medici instigates
the St. Bartholomew's Day massacre which takes the lives of Protestant leader Gaspard de Coligny and thousands of Huguenots. The violence spreads from Paris to other cities and the countryside.1572: First edition of the epic The Lusiads of Lus Vaz de Cames, three years after the author returned from the East.[14]1572: The 9 years old Taizi, Zhu
Yijun ascended the throne of Ming dynasty, known as Wanli Emperor.1573: After heavy losses on both sides the siege of Haarlem ends in a Spanish victory.St. Bartholomew's Day massacre of French Protestants1574: in the Eighty Years' War the capital of Zeeland, Middelburg declares for the Protestants.1574: After a siege of 4 months the siege of
Leiden ends in a comprehensive Dutch rebel victory.1575: Oda Nobunaga finally captures Nagashima fortress.1575: Following a five-year war, the Ternateans under Sultan Babullah defeated the Portuguese.1576: Tahmasp I, Safavid shah, dies.1576: The Battle of Haldighati is fought between the ruler of Mewar, Maharana Pratap and the Mughal
Empire's forces under Emperor Akbar led by Raja Man Singh.1576: Sack of Antwerp by badly paid Spanish soldiers.15771580: Francis Drake circles the world.1577: Ki Ageng Pemanahan built his palace in Pasargede or Kotagede.1578: King Sebastian of Portugal is killed at the Battle of Alcazarquivir.1578: The Portuguese establish a fort on Tidore
but the main centre for Portuguese activities in Maluku becomes Ambon.[12]1578: Sonam Gyatso is conferred the title of Dalai Lama by Tumed Mongol ruler, Altan Khan. Recognised as the reincarnation of two previous Lamas, Sonam Gyatso becomes the third Dalai Lama in the lineage.[15]1578: Governor-General Francisco de Sande officially
declared war against Brunei in 1578, starting the Castilian War of 1578.1579: The Union of Utrecht unifies the northern Netherlands, a foundation for the later Dutch Republic.1579: The Union of Arras unifies the southern Netherlands, a foundation for the later states of the Spanish Netherlands, the Austrian Netherlands and Belgium.The Irish Gaelic
chieftain's feast, from The Image of Ireland1579: The British navigator Sir Francis Drake passes through Maluku and transit in Ternate on his circumnavigation of the world. The Portuguese establish a fort on Tidore but the main centre for Portuguese activities in Maluku becomes Ambon.[16]The fall of Spanish Armada1580: Drake's royal reception
after his attacks on Spanish possessions influences Philip II of Spain to build up the Spanish Armada. English ships in Spanish harbours are impounded.1580: Spain unifies with Portugal under Philip II. The struggle for the throne of Portugal ends the Portuguese Empire. The Spanish and Portuguese crowns are united for 60 years, i.e. until
1640.15801587: Nagasaki comes under control of the Jesuits.1581: Dutch Act of Abjuration, declaring abjuring allegiance to Philip II of Spain.1581: Bayinnaung dies at the age of 65.1582: Oda Nobunaga commits seppuku during the Honn-ji Incident coup by his general, Akechi Mitsuhide.1582: Pope Gregory XIII issues the Gregorian calendar. The
last day of the Julian calendar was Thursday, 4 October 1582 and this was followed by the first day of the Gregorian calendar, Friday, 15 October 15821582: Yermak Timofeyevich conquers the Siberia Khanate on behalf of the Stroganovs.1583: Denmark builds the world's first theme park, Bakken.1583: Death of Sultan Babullah of Ternate.15841585:
After the siege of Antwerp, many of its merchants flee to Amsterdam. According to Luc-Normand Tellier, "At its peak, between 1510 and 1557, Antwerp concentrated about 40% of the world trade...It is estimated that the port of Antwerp was earning the Spanish crown seven times more revenues than the Americas."[17]1584: Ki Ageng Pemanahan
died. Sultan Pajang raised Sutawijaya, son of Ki Ageng Pemanahan as the new ruler in Mataram, titled "Loring Ngabehi Market" (because of his home in the north of the market).1585: Akbar annexes Kashmir and adds it to the Kabul SubahPortuguese fusta in India from a book by Jan Huygen van Linschoten1585: Colony at Roanoke founded in North
America.15851604: The Anglo-Spanish War is fought on both sides of the Atlantic.1587: Mary, Queen of Scots is executed by Elizabeth I.1587: The reign of Abbas I marks the zenith of the Safavid dynasty.1587: Troops that would invade Pajang Mataram Sultanate storm ravaged the eruption of Mount Merapi. Sutawijaya and his men survived.1588:
Mataram into the kingdom with Sutawijaya as Sultan, titled "Senapati Ingalaga Sayidin Panatagama" means the warlord and cleric Manager Religious Life.1588: England repulses the Spanish Armada.1589: Spain repulses the English Armada.1589: Catherine de' Medici dies at aged 69.Abu'l-Fazl ibn Mubarak presenting Akbarnama to Mughal Azam
Akbar, Mughal miniature1590: Siege of Odawara: the Go-Hojo clan surrender to Toyotomi Hideyoshi, and Japan is unified.1591: Gazi Giray leads a huge Tatar expedition against Moscow.1591: In Mali, Moroccan forces of the Sultan Ahmad al-Mansur led by Judar Pasha defeat the Songhai Empire at the Battle of Tondibi.15921593: John Stow reports
10,675 plague deaths in London, a city of approximately 200,000 people.15921598: Korea, with the help of Ming dynasty China, repels two Japanese invasions.15931606: The Long War between the Habsburg monarchy and the Ottoman Turks.1594: St. Paul's College, Macau, founded by Alessandro Valignano.1595: First Dutch expedition to Indonesia
sets sail for the East Indies with two hundred and forty-nine men and sixty-four cannons led by Cornelis de Houtman.[18]1596: Birth of Ren Descartes.1596: June, de Houtman's expedition reaches Banten the main pepper port of West Java where they clash with both the Portuguese and Indonesians. It then sails east along the north coast of Java
losing twelve crew to a Javanese attack at Sidayu and killing a local ruler in Madura.[18]1597: Romeo and Juliet is published.1597: Cornelis de Houtman's expedition returns to the Netherlands with enough spices to make a considerable profit.[18]1598: The Edict of Nantes ends the French Wars of Religion.1598: Abbas I moves Safavids capital from
Qazvin to Isfahan in 1598.15981613: Russia descends into anarchy during the Time of Troubles.1598: The Portuguese require an armada of 90 ships to put down a Solorese uprising.[12] (to 1599)1598: More Dutch fleets leave for Indonesia and most are profitable.[18]Edo period screen depicting the Battle of Sekigahara1598: The province of Santa Fe
de Nuevo Mxico is established in Northern New Spain. The region would later become a territory of Mexico, the New Mexico Territory in the United States, and the US State of New Mexico.1598: Death of Toyotomi Hideyoshi, known as the unifier of Japan.1599: The Mali Empire is defeated at the Battle of Jenn.1599: The van Neck expedition returns
to Europe. The expedition makes a 400 per cent profit.[18] (to 1600)1599: March, Leaving Europe the previous year, a fleet of eight ships under Jacob van Neck was the first Dutch fleet to reach the Spice Islands of Maluku.[18]1600: Giordano Bruno is burned at the stake for heresy in Rome.Siege of Fiakovo castle during the Long Turkish War1600:
Battle of Sekigahara in Japan. End of the Warring States period and beginning of the Edo period.1600: The Portuguese win a major naval battle in the bay of Ambon.[19] Later in the year, the Dutch join forces with the local Hituese in an anti-Portuguese alliance, in return for which the Dutch would have the sole right to purchase spices from Hitu.
[19]1600: Elizabeth I grants a charter to the British East India Company beginning the English advance in Asia.1600: Michael the Brave unifies the three principalities: Wallachia, Moldavia and Transylvania after the Battle of elimbr from 1599.For later events, see Timeline of the 17th century.Polybius' The Histories translated into Italian, English,
German and French.[20]Mississippian culture disappears.Medallion rug, variant Star Ushak style, Anatolia (modern Turkey), is made. It is now kept at the Saint Louis Art Museum.Hernan Cortes (14851547)Henry VIII, (14911547) King of England and IrelandDon Fernando lvarez de Toledo (15071582)Suleiman the Magnificent, Sultan of the Ottoman
Empire (15201566)Ivan IV the Terrible (15301584)Oda Nobunaga (15341582)Sir Francis Drake (c. 1540 1596)Alberico Gentili, (15521608) the Father of international lawPhilip II of Spain, King of Spain (15561598)Akbar the Great, Mughal emperor (15561605)Related article: List of 16th century inventions.The Columbian Exchange introduces many
plants, animals and diseases to the Old and New Worlds.Introduction of the spinning wheel revolutionizes textile production in Europe.The letter J is introduced into the English alphabet.1500: First portable watch is created by Peter Henlein of Germany.The Iberian Union in 1598, under Philip II, King of Spain and Portugal1513: Juan Ponce de Len
sights Florida and Vasco Nez de Balboa sights the eastern edge of the Pacific Ocean.15191522: Ferdinand Magellan and Juan Sebastin Elcano lead the first circumnavigation of the world.15191540: In America, Hernando de Soto expeditions map the Gulf of Mexico coastline and bays.1525: Modern square root symbol ()1540: Francisco Vsquez de
Coronado sights the Grand Canyon.154142: Francisco de Orellana sails the length of the Amazon River.154243: Firearms are introduced into Japan by the Portuguese.1543: Copernicus publishes his theory that the Earth and the other planets revolve around the Sun1545: Theory of complex numbers is first developed by Gerolamo Cardano of
Italy.1558: Camera obscura is first used in Europe by Giambattista della Porta of Italy.15591562: Spanish settlements in Alabama/Florida and Georgia confirm dangers of hurricanes and local native warring tribes.1565: Spanish settlers outside New Spain (Mexico) colonize Florida's coastline at St. Augustine.1565: Invention of the graphite pencil (in a
wooden holder) by Conrad Gesner. Modernized in 1812.1568: Gerardus Mercator creates the first Mercator projection map.1572: Supernova SN 1572 is observed by Tycho Brahe in the Milky Way.1582: Gregorian calendar is introduced in Europe by Pope Gregory XIII and adopted by Catholic countries.c. 1583: Galileo Galilei of Pisa, Italy identifies
the constant swing of a pendulum, leading to development of reliable timekeepers.1585: earliest known reference to the 'sailing carriage' in China.1589: William Lee invents the stocking frame.1591: First flush toilet is introduced by Sir John Harrington of England, the design published under the title 'The Metamorphosis of Ajax'.1593: Galileo Galilei
invents a thermometer.1596: William Barents discovers Spitsbergen.1597: Opera in Florence by Jacopo Peri.Entertainment in the 16th century^ a b Modern reference works on the period tend to follow the introduction of the Gregorian calendar for the sake of clarity; thus NASA's lunar eclipse catalogue states "The Gregorian calendar is used for all
dates from 1582 Oct 15 onwards. Before that date, the Julian calendar is used." For dates after 15 October 1582, care must be taken to avoid confusion of the two styles.^ de Vries, Jan (14 September 2009). "The limits of globalization in the early modern world". The Economic History Review. 63 (3): 710733. CiteSeerX10.1.1.186.2862.
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An Encyclopedia of World History (5th ed. 1973); highly detailed outline of events online free Media related to 16th century at Wikimedia CommonsTimelines of 16th century events, science, culture and personsRetrieved from " 4The following pages link to 16th century External tools(link counttransclusion countsorted list) See help page for transcluding these entriesShowing 50 items.View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500)Bagpipes (links | edit)List of decades, centuries, and millennia (links | edit)Fashion (links | edit)Giovanni Boccaccio (links | edit)History of Mali (links | edit)History of Mauritius (links | edit)Post office (links | edit)Snare drum (links | edit)Republican Party (United States) (links | edit)20th century (links | edit)15th century (links | edit)17th century (links | edit)18th century (links | edit)1624 (links | edit)1626 (links | edit)1642 (links | edit)1661 (links | edit)1608 (links | edit)1492 (links | edit)14th century (links | edit)1st century (links | edit)13th century (links | edit)4th century (links | edit)12th century (links | edit)11th century (links | edit)1564 (links | edit)1648 (links | edit)1572 (links | edit)1623 (links | edit)1662 (links | edit)1490s (links | edit)1640s (links | edit)1597 (links | edit)1690 (links | edit)1688 (links | edit)7th century (links | edit)10th century (links | edit)9th century (links | edit)8th century (links | edit)6th century (links | edit)5th century (links | edit)3rd century (links | edit)2nd century (links | edit)1573 (links | edit)1570s (links | edit)1574 (links | edit)1436 (links | edit)1476 (links | edit)1542 (links | edit)1540s (links | edit)View (previous 50 | next 50) (20 | 50 | 100 | 250 | 500)Retrieved from " WhatLinksHere/16th_century" Fact Checked Content Last Updated: 14.09.2023 17 min reading time Content creation process designed by Content cross-checked by Content quality checked by Save Article Save Article In mathematical analysis, encountering maxima and minima of functions of two variables forms a crucial basis in better understanding the nature of these functions. This subject primarily explores how to determine points at which your function reaches its highest (maxima) and lowest (minima) values. This knowledge is vital in various fields including engineering and computer science as it aids in solving optimisation problems. Within the realm of calculus, functions are said to have a maximum at a certain point if the function's value at that point is greater than or equal to the value of the function at any nearby point. Conversely, a function has a minimum at a point where the function's value is less than or equal to the value at any nearby point. When these concepts are extended to functions of two variables, these points become extreme values. To further illustrate these ideas, consider the topography of a landscape. At the peak of a mountain, all nearby points are lower. This peak point can be regarded as a maximum, or a local maxima. At the base of a valley, you're lower than all the surrounding points, constituting a minimum, or a local minima. To find the maxima and minima of a function of two variables, you primarily engage in a three-step process: Find the first-order partial derivatives of the function.Set these derivatives equal to zero and solve for the variables to find the critical points.Use the second derivatives test to determine whether these critical points are minima, maxima or saddle points.Codedef derivative(func, var): h = 1.0/1000 return (func(var + h) - func(var - h))/(2*h) For the second derivatives test, a table can provide a helpful visualisation: f_xxf_yyf_xyCritical point Here \(f_{xx} \), \(f_{yy} \) and \(f_{xy} \) represent the second derivatives of the function with respect to \(x \) and \(y \), and their values at the critical point respectively. Differentiating between maxima and minima involves the application of the second partial derivative test. This test lets you distinguish local minima, local maxima and saddle points. If a function \(f(x, y) \) achieves a given value at some point within its domain and no other point in some surrounding region achieves a greater value, then that value is a local maximum. If its the least value, then its a local minimum. If it's neither a local maximum nor a local minimum, then it's a saddle point. In the end, understanding maxima and minima of functions of two variables enables you to better optimise solutions in fields such as engineering, economics and computer science. To better understand the concept of maxima and minima of two-variable functions, there's no better method than going through examples. They provide practical insights and illustrate the theoretical principles discussed earlier. It's a safe space to build understanding, learning from errors, and developing a strong foundation for tackling more complex problems. Let's start with a basic problem. We have the function \(f(x, y) = -(x^2 + y^2) \).Here are the steps to solve the problem: Obtain the first-order partial derivatives of the function. This would yield \(\frac{\partial f}{\partial x} = -2x \) and \(\frac{\partial f}{\partial y} = -2y \).Find the critical points by setting these partial derivatives equal to 0. Solving gives the single critical point (0,0).Finally, determine if this point is a maximum, minimum, or saddle point, by using the second derivative test. The second order derivatives are \(\frac{\partial^2 f}{\partial x^2} = -2 \), \(\frac{\partial^2 f}{\partial y^2} = -2 \) and \(\frac{\partial^2 f}{\partial x \, \partial y} = 0 \). Calculate \(D = \frac{\partial^2 f}{\partial x^2} \frac{\partial^2 f}{\partial y^2} - (\frac{\partial^2 f}{\partial x \, \partial y})^2 \), which gives \(D = 4 \) at the critical point (0,0). Since \(D > 0 \) and \(\frac{\partial^2 f}{\partial x^2} < 0 \), the function has a local maximum at (0,0). As you progress, problems will become more complex. Let's see how to handle more intricate examples. Consider the function \(f(x, y) = x^3 + 3xy + y^3 \). The first order derivatives are \(\frac{\partial f}{\partial x} = 3x^2 + 3y \) and \(\frac{\partial f}{\partial y} = x^3 - 3x^2 - 6y \). Setting these equal to zero and solving, we find two critical points: (-1,1) and (0,0). The second order partial derivatives are \(\frac{\partial^2 f}{\partial x^2} = 1 \), \(\frac{\partial^2 f}{\partial y^2} = -6 \) and \(\frac{\partial^2 f}{\partial x \, \partial y} = 0 \). Applying the second derivative test, at (-1,1), \(D = 6 > 0 \) and \(\frac{\partial^2 f}{\partial x^2} > 0 \), we find a local minimum. At the point (0,0), since \(D < 0 \), we have a saddle point. Solving problems involves consistent application of the steps previously outlined. With practice, the procedure becomes easier. Let's examine another example. Consider the function \(f(x, y) = xe^{-x^2-y^2} \). The first-order partial derivatives are \(\frac{\partial f}{\partial x} = e^{-x^2-y^2}(1-2x^2) \) and \(\frac{\partial f}{\partial y} = -2xye^{-x^2-y^2} \). Setting these equal to zero and solving, we find the points (0,0), (1,0) and (-1,0) as the critical points. The second order derivatives are \(\frac{\partial^2 f}{\partial x^2} = e^{-x^2-y^2}(4x^3-6x) \), \(\frac{\partial^2 f}{\partial y^2} = 2ye^{-x^2-y^2}(2y^2-1) \) and \(\frac{\partial^2 f}{\partial x \, \partial y} = 2xe^{-x^2-y^2}(2y^2-1) \). Applying the second derivative test, for example, at the point (1,0), \(D = 0 \), it's inconclusive. Follow these examples to gain a solid understanding of how to find maxima and minima of functions of two variables. They are essential building blocks for solving optimization problems and other integral aspects of engineering and computer science. When dealing with the topic of maxima and minima of functions of two variables, there often arises a scenario where constraints are present. These constraints could be certain limits on the values that the variables involved can take. Dealing with these constraints is essential for accurate analysis and seeking solutions for optimisation problems. In many realistic scenarios, the function being investigated is subject to certain conditions or constraints. These are typically written in the form \(g(x, y) = c \), where \(g \) is a function that describes a specific condition that \(x \) and \(y \) must satisfy, and \(c \) is a constant value. Understanding constraints in the context of maxima and minima is vital in a range of fields, including engineering, computer science and economics. For instance, in business optimisation problems, constraints could represent budget limits or manufacturing capabilities. An important term in this context is the Lagrange Multiplier, a strategy used to find the local maxima and minima of a function subject to equality constraints. A Lagrange Multiplier is a scalar multiplier used in the method of Lagrange multipliers, which is a method for finding the local maxima and minima of a function subject to equality constraints. The constraints are incorporated into the function using these multipliers. When solving for maxima and minima of functions of two variables, the approach changes when constraints are involved. Instead of merely searching for values which make the first derivatives equal to zero, it's now crucial to consider the constraints as well. In this respect, the method of Lagrange multipliers is frequently used. Here's how you can employ it: Firstly, formulate the Lagrange function: \(L(x, y,) = f(x, y) - (g(x, y) - c) \). Here, \(\) is the Lagrange multiplier, and \(g(x, y) = c \) is the constraint.Find the partial derivatives of \(L \) with respect to \(x \), \(y \) and \(\), and set them equal to zero. In mathematical terms, this means solving for \(\frac{\partial L}{\partial x} = 0 \), \(\frac{\partial L}{\partial y} = 0 \), and \(\frac{\partial L}{\partial } = 0 \).Solve these equations for \(x \), \(y \), and \(\). This method allows the problem to be rephrased as finding critical points of a different function, which often simplifies the scenario. When tasked with finding maxima and minima of functions of two variables with constraints, a systematic and strategic approach can greatly facilitate the process. Here are some valuable strategies: Visualisation: If possible, visualising the function and the constraint can provide a good intuition. Sketching level curves or using computer-graphing tools are potential option.Analysis: Inspect the function and the constraint(s). Be aware of any symmetry, periodicity, or other characteristics that could be leveraged.Application of the method of Lagrange Multipliers: The method of Lagrange multipliers is a powerful tool for problems involving constraints. It incorporates the constraint directly into the function being optimised.Verification: After finding potential maxima and minima, verify them by either utilising the second derivative test or by comparing function values. In conclusion, constraints complicate the process of finding maxima and minima of functions with two variables. However, with the right understanding and techniques, it's still possible to accurately solve these problems. Understanding how to locate maxima and minima of functions with more than one variable is an essential skill in various scientific and engineering fields. Determining these values involves a series of analytical steps, the use of refined mathematical techniques, and even computational tools in complex settings. The journey to find the maxima and minima of functions of two variables involves a systematic approach. Here, you'll walk through an explicit procedure to tackle these problems. Firstly, the foundation lies in **Partial Differentiation**. A function of two variables, \(f(x, y) \), first needs to be partially differentiated with respect to both the variables. This yields two equations, the partial derivatives being set equal to zero: \[\frac{\partial f}{\partial x} = 0 \] \[\frac{\partial f}{\partial y} = 0 \] Solving these equations supplies the critical points of the function in question. The next key step is the **Second Derivative Test**. After locating the critical points, you'll need to classify them as local maxima, local minima, or saddle points. For this purpose, the second-order partial derivatives are necessary: \[\frac{\partial^2 f}{\partial x^2}, \frac{\partial^2 f}{\partial y^2}, \frac{\partial^2 f}{\partial x \, \partial y}\] The determinant \(D \) is then computed using these second derivatives as: \[D = \frac{\partial^2 f}{\partial x^2} \cdot \frac{\partial^2 f}{\partial y^2} - \left(\frac{\partial^2 f}{\partial x \partial y} \right)^2\] Now, the sign of \(D \) and \(\frac{\partial^2 f}{\partial x^2} \) gives the nature of the critical point: If \(D>0 \) and \(\frac{\partial^2 f}{\partial x^2}>0 \), it is a local minimum.If \(D>0 \) and \(\frac{\partial^2 f}{\partial x^2}