Precalculus

Description of the Examination

The Precalculus examination assesses student mastery of skills and concepts required for success in a first-semester calculus course. A large portion of the exam is devoted to testing a student's understanding of functions and their properties. Many of the questions test a student's knowledge of specific properties of the following types of functions: linear, quadratic, absolute value, square root, polynomial, rational, exponential, logarithmic, trigonometric, inverse trigonometric and piecewise-defined. Questions on the exam will present these types of functions symbolically, graphically, verbally or in tabular form. A solid understanding of these types of functions is at the core of all precalculus courses, and it is a prerequisite for enrolling in calculus and other college-level mathematics courses.

The examination contains approximately 48 questions, in two sections, to be answered in 90 minutes.

- Section 1: 25 questions, 50 minutes. The use of an **online graphing calculator (non-CAS)** is allowed for this section. Only some of the questions will require the use of the calculator.
- Section 2: 23 questions, 40 minutes. No calculator is allowed for this section.

Although most of the questions on the exam are multiple-choice, there are some questions that require students to enter a numerical answer.

Graphing Calculator

A graphing calculator, which is integrated into the exam software, is available to students only during Section 1 of the exam. Students are expected to know how and when to make use of it. The graphing calculator, together with a brief tutorial, is available to students as a free download for a 90-day trial period. **Students are expected to become familiar with its functionality prior to taking the exam.**

For more information about downloading the practice version of the graphing calculator, please visit the Precalculus exam description on the CLEP website, clep.collegeboard.org.

In order to answer some of the questions in Section 1 of the exam, students may be required to use the online graphing calculator in the following ways:

- Perform calculations (e.g., exponents, roots, trigonometric values, logarithms).
- Graph functions and analyze the graphs.
- Find zeros of functions.
- Find points of intersection of graphs of functions.
- Find minima/maxima of functions.
- Find numerical solutions to equations.
- Generate a table of values for a function.

Knowledge and Skills Required

Questions on the examination require candidates to demonstrate the following abilities.

- Recalling factual knowledge and/or performing routine mathematical manipulation.
- Solving problems that demonstrate comprehension of mathematical ideas and/or concepts.
- Solving nonroutine problems or problems that require insight, ingenuity or higher mental processes.

The subject matter of the Precalculus examination is drawn from the following topics. The percentages next to the topics indicate the approximate percentage of exam questions on that topic.

20% Algebraic Expressions, Equations and Inequalities

Ability to perform operations on algebraic expressions

Ability to solve equations and inequalities, including linear, quadratic, absolute value, polynomial, rational, radical, exponential, logarithmic and trigonometric

Ability to solve systems of equations, including linear and nonlinear

15% Functions: Concept, Properties and Operations

Ability to demonstrate an understanding of the concept of a function, the general properties of functions (e.g., domain, range), function notation, and to perform symbolic operations with functions (e.g., evaluation, inverse functions)

30% Representations of Functions: Symbolic, Graphical and Tabular

Ability to recognize and perform operations and transformations on functions presented symbolically, graphically or in tabular form

Ability to demonstrate an understanding of basic properties of functions and to recognize elementary functions (linear, quadratic, absolute value, square root, polynomial, rational, exponential, logarithmic, trigonometric, inverse trigonometric and piecewise-defined functions) that are presented symbolically, graphically or in tabular form

10% Analytic Geometry

Ability to demonstrate an understanding of the analytic geometry of lines, circles, parabolas, ellipses and hyperbolas

15% Trigonometry and its Applications*

Ability to demonstrate an understanding of the basic trigonometric functions and their inverses and to apply the basic trigonometric ratios and identities (in right triangles and on the unit circle)

Ability to apply trigonometry in various problem-solving contexts

10% Functions as Models

Ability to interpret and construct functions as models and to translate ideas among symbolic, graphical, tabular and verbal representations of functions

***Note that trigonometry permeates most of the major topics and accounts for more than 15 percent of the exam. The actual proportion of exam questions that requires knowledge of either right triangle trigonometry or the properties of the trigonometric functions is approximately 30–40 percent.**

Notes and Reference Information

The following information will be available for reference during the exam.

(1) Figures that accompany questions are intended to provide information useful in answering the questions. All figures lie in a plane unless otherwise indicated. The figures are drawn as accurately as possible EXCEPT when it is stated in a specific question that the figure is not drawn to scale. Straight lines and smooth curves may appear slightly jagged on the screen.

(2) Unless otherwise specified, all angles are measured in radians, and all numbers used are real numbers. For some questions in this test, you may have to decide whether the calculator should be in radian mode or degree mode.

(3) Unless otherwise specified, the domain of any function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number. The range of f is assumed to be the set of all real numbers $f(x)$, where x is in the domain of f.

(4) In this test, $\log x$ denotes the common logarithm of x (that is, the logarithm to the base 10) and $\ln x$ denotes the natural logarithm of x (that is, the logarithm to the base e).

(5) The inverse of a trigonometric function f may be indicated using the inverse function notation f^{-1} or with the prefix "arc" (e.g., $\sin^{-1} x = \arcsin x$).

(6) The range of $\sin^{-1} x$ is $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$.

The range of $\cos^{-1} x$ is $[0, \pi]$.

The range of $\tan^{-1} x$ is $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$.

(7) Law of Sines: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Law of Cosines: $c^2 = a^2 + b^2 - 2ab\cos C$

(8) Sum and Difference Formulas:

$\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$

$\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$

$\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$

$\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$

Sample Test Questions

The following sample questions do not appear on an actual CLEP examination. They are intended to give potential test-takers an indication of the format and difficulty level of the examination and to provide content for practice and review. Knowing the correct answers to all of the sample questions is not a guarantee of satisfactory performance on the exam.

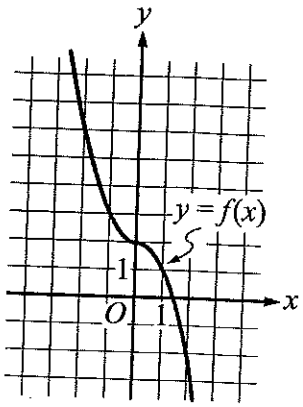
Section I

Directions: A graphing calculator will be available for the questions in this section. Some questions will require you to select from among five choices. For these questions, select the BEST of the choices given. If the exact numerical value of your answer is not one of the choices, select the choice that best approximates this value. Some questions will require you to enter a numerical answer in the box provided.

1. For each of the following functions, indicate whether it is even, odd, or neither even nor odd.

Function	Even	Odd	Neither
$f(x) = \frac{e^x + e^{-x}}{2}$			
$g(x) = \lvert\sin x\rvert$			
$h(x) = 8x^4 + 4x^2 + 2x$			

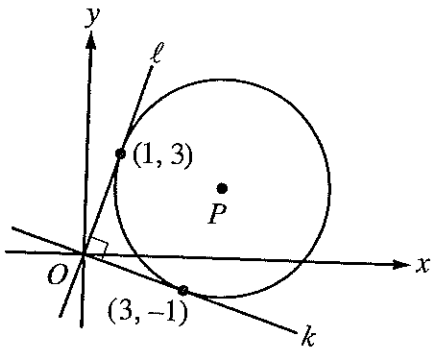
Click on your choices.



x	$g(x)$
–2	–4
–1	0
0	2
1	2
2	4

2. The graph of the function f and a table of values for the function g are shown above. What is the value of $f(g(0))$?

(A) –4
(B) –2
(C) 0
(D) 2
(E) 4



3. The circle with center P is tangent to perpendicular lines ℓ and k at points (1, 3) and (3, –1), respectively, as shown above. Which of the following is an equation of the circle with center P ?

(A) $x^2+y^2=\sqrt{10}$
(B) $(x-3)^2+(y-3)^2=10$
(C) $(x-1)^2+(y-3)^2=20$
(D) $(x-4)^2+(y-2)^2=10$
(E) $(x-4)^2+(y-2)^2=20$

4. $(\sin t+\cos t)^2=$

(A) 1
(B) $1+2\sin t$
(C) $1+\sin 2t$
(D) $\sin\left(t^2\right)+\cos\left(t^2\right)$
(E) $\sin\left(t^2\right)+2\sin t\cos t+\cos\left(t^2\right)$

$$f(x)=e^{(x/4)}$$
$$g(x)=2\sin x$$

5. The functions f and g are defined above and their domains are all real numbers. On what interval is the value of $f(x)$ greater than the maximum value of g ?

(A) $x>1.571$
(B) $x>2.125$
(C) $x>2.773$
(D) $0.624<x<2.125$
(E) $2.125<x<2.773$

6. If $\pi\le\theta\le 2\pi$ and $\cos\theta=\cos 1$, what is the value of θ? Round your answer to the nearest hundredth.

$$h(x)=\frac{x^2e^x}{x}$$

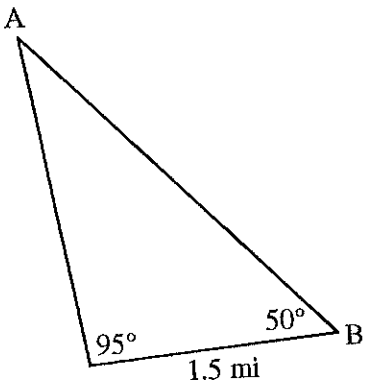
7. The function h is defined above. Which of the following are true about the graph of $y=h(x)$?

I. The graph has a vertical asymptote at $x=0$.

II. The graph has a horizontal asymptote at $y=0$.

III. The graph has a minimum point.

(A) None
(B) I and II only
(C) I and III only
(D) II and III only
(E) I, II, and III



8. A transport authority plans to construct a bridge between City A and City B. To determine the distance between the cities, a surveyor team uses the triangular region shown. What is the distance between City A and City B, to the nearest tenth of a mile?

(A) 0.7 mile
(B) 1.6 miles
(C) 2.0 miles
(D) 2.6 miles
(E) 3.0 miles

9. Let f be the function defined by $f(x)=5\sin(2x)+1$ for $0\le x\le\pi$. What is the slope of the line passing through the maximum and minimum points of the function on the interval?

(A) $-\frac{20}{\pi}$

(B) $-\frac{10}{\pi}$

(C) $-\frac{5}{\pi}$

(D) $\frac{10}{\pi}$

(E) $\frac{20}{\pi}$

10. What are <u>all</u> solutions to the equation $e^{2x}-e^x-2=0$?

(A) 0 only
(B) $\ln 2$ only
(C) 2 only
(D) –1 and 2
(E) 0 and $\ln 2$

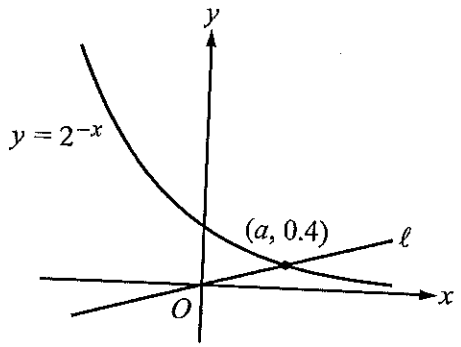
$$4\cos x=9\sin x$$

11. Which of the following is the solution to the equation above in the interval $\left[0,\frac{\pi}{2}\right]$?

(A) 0.4182
(B) 0.4606
(C) 1.1102
(D) 1.1526
(E) 4.4762

12. Let f be the function defined by $f(x) = -|x|$. The graph of the function g in the xy-plane is obtained by first translating the graph of f horizontally 3 units to the left and then vertically translating this result 2 units up. What is the value of $g(-2)$?

(A) –7
(B) –3
(C) 0
(D) 1
(E) 3



13. In the figure above, line ℓ passes through the origin and intersects the graph of $y = 2^{-x}$ at the point $(a, 0.4)$. What is the slope of line ℓ ?

(A) 0.200
(B) 0.303
(C) 0.528
(D) 1.322
(E) 3.305

14. In the xy-plane, the graph of $y = x^2 + bx + c$ is symmetric about the line $x = 3$ and passes through the point (5, 2). What is the value of c ?

$A(t) = ke^{-0.001t}$, where k is a constant.

15. When a certain radioactive element decays, the amount, in milligrams, that remains after t years can be approximated by the function A above. Approximately how many years would it take for an initial amount of 800 milligrams of this element to decay to 400 milligrams?

(A) 173
(B) 347
(C) 693
(D) 1,386
(E) 2,772

16. If $g(x) = \frac{1}{x}$ and h is a nonzero real number, then $\frac{g(x+h) - g(x)}{h} =$

(A) 1
(B) $\frac{1}{(x+h)^2} - \frac{1}{x^2}$
(C) $\frac{h-1}{hx}$
(D) $\frac{-1}{x(x+h)}$
(E) $\frac{-h^2}{x(x+h)}$

$h(t) = 64 - 46\cos\left(\frac{\pi}{5}t\right)$, where $0 \le t \le 10$

17. The function h above gives the height above the ground, in feet, of a passenger on a Ferris wheel t minutes after the ride begins. During one revolution of the Ferris wheel, for how many minutes is the passenger at least 100 feet above the ground? Round your answer to the nearest hundredth of a minute.

18. How many different values of x satisfy the equation $\sin x + 2\sin(2x) = \sqrt{x}$?

(A) One
(B) Two
(C) Three
(D) Five
(E) Infinitely many

19. A ball is dropped from an initial height of d feet above the floor and repeatedly bounces off the floor. Each time the ball hits the floor, it rebounds to a maximum height that is $\frac{3}{4}$ of the height from which it previously fell. The function h models the maximum height, in feet, to which the ball rebounds on the nth bounce. Which of the following is an expression for $h(n)$?

(A) $h(n) = \left(\frac{3}{4}\right)^n d$
(B) $h(n) = \left(\frac{3}{4} d\right)^n$
(C) $h(n) = \frac{3}{4} d^n$
(D) $h(n) = d^{\frac{3}{4}n}$
(E) $h(n) = n^{\frac{3}{4}d}$

20. In the xy-plane, the vertex of the parabola $x = y^2 + 4y + 1$ is the point (h, k). What is the value of k?

(A) –13
(B) –5
(C) –2
(D) 2
(E) 5

21. The measure of a certain angle is 25°. What is the corresponding radian measure of the angle?

(A) $\frac{5\pi}{36}$
(B) $\frac{5\pi}{18}$
(C) $\frac{5\pi}{9}$
(D) $\frac{18}{5\pi}$
(E) $\frac{36}{5\pi}$

22. A rectangular box with a square base is open at the top and has a volume of 12 cubic feet. Each side of the base has a length of x feet. Which of the following expresses the surface area, S, in square feet, of the outside of the box in terms of x?

(A) $S = 5x^2$
(B) $S = \frac{12}{x^2}$
(C) $S = x^2 + \frac{24}{x}$
(D) $S = x^2 + \frac{48}{x}$
(E) $S = x^2 + \frac{48}{x^2}$

23. What is the domain of the function $y = \log(\tan x)$?

(A) $(0, \infty)$
(B) $\left(0, \frac{\pi}{2}\right)$ only
(C) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ only
(D) $\left(k\pi, k\pi + \frac{\pi}{2}\right)$ for all integers k
(E) $\left(k\pi - \frac{\pi}{2}, k\pi + \frac{\pi}{2}\right)$ for all integers k

x	0	1	2	3
$p(x)$	11	10	11	14

24. The table above shows selected values for the function p. If p is a quadratic polynomial, what is the value of $p(10)$?

25. If $\log_{2b} x^5 = T$ and $b > \frac{1}{2}$, then $x =$

(A) $(2b)^{\frac{T}{5}}$

(B) $2b^{\frac{T}{5}}$

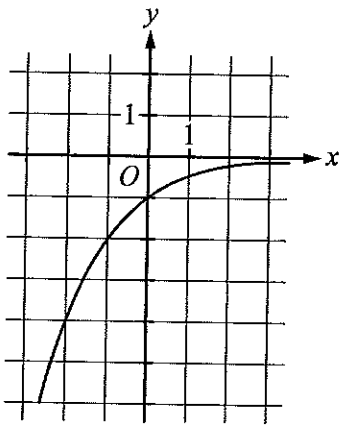
(C) $2b^{5T}$

(D) $(2b)^{5T}$

(E) $\frac{(2b)^T}{5}$

26. The population of city Z was 420,000 in the year 2000. If the population is projected to grow at a constant rate of 2 percent per year, which of the following is closest to the projected population of city Z in the year 2030?

(A) 430,000
(B) 510,000
(C) 670,000
(D) 760,000
(E) 4,300,000



27. The graph of $y = a\left(b^x\right)$, where a and b are constants and $b > 0$, is shown above. If the points $(0,-1)$ and $(2,-0.25)$ are on the graph, what is the value of b ?

$b =$

Section II

Directions: A calculator will not be available for the questions in this section. Some questions will require you to select from among five choices. For these questions, select the BEST of the choices given. Some questions will require you to enter a numerical answer in the box provided.

28. If $\left(x-\sqrt{5}\right)\left(x+\sqrt{5}\right)=5$, what is the value of x?

(A) $5\pm\sqrt{5}$
(B) $-5\pm\sqrt{5}$
(C) ±5
(D) $\pm\sqrt{10}$
(E) $\pm\sqrt{30}$

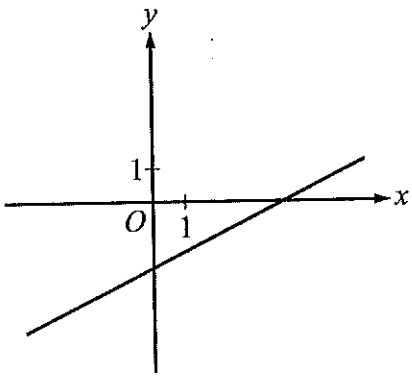
29. If $f(x)=2x+1$ and $g(x)=3x-1$, then $f(g(x))=$

(A) $5x$
(B) $x-2$
(C) $6x-1$
(D) $6x+2$
(E) $6x^2+x-1$

30. Let f and g be the functions defined by $f(x)=\sqrt{x+2}$ and $g(x)=x^2-a$, where a is a positive constant. What are all values of a for which the graphs of f and g have exactly one point of intersection?

(A) $0<a<2$
(B) $a=2$
(C) $a>2$
(D) $a=4$ only
(E) $a>4$ only

31. An experiment designed to measure the growth of bacteria began at 2:00 P.M. and ended at 8:00 P.M. on the same day. The number of bacteria is given by the function N, where $N(t)=1000\cdot3^{2t/3}$ and t represents the number of hours that have elapsed since the experiment began. How many more bacteria were there at the end of the experiment than at the beginning of the experiment?



32. The equation of the line shown in the graph above is $y=ax+b$. Which of the following is always true for this line?

(A) $ab<0$
(B) $ab>0$
(C) $ab=0$
(D) $a=b$
(E) $a=-b$

33. What is the x-intercept of the graph of $y=\frac{1}{8}x^{3/2}-8$?

(A) -16
(B) -8
(C) $\frac{1}{16}$
(D) 16
(E) 512

34. The function h is given by $h(x)=\log_2\left(x^2+2\right)$. For what positive value of x does $h(x)=3$?

(A) 1
(B) 2
(C) 8
(D) $\sqrt{6}$
(E) $\sqrt{7}$

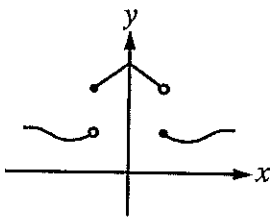
35. Which of the following relations define y as a function of x?

I. $x^2+(y-3)^2=4$

II.

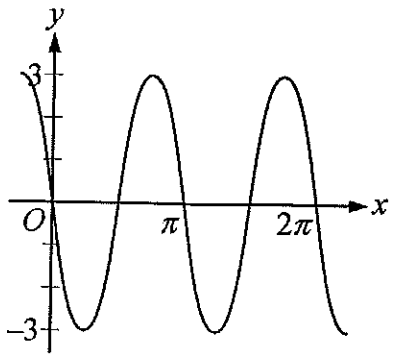
x	0	1	2	3	4
y	10	20	30	20	10

III.



(A) II only
(B) III only
(C) I and II
(D) I and III
(E) II and III

36. In the xy-plane, the lines with equations $2x+2y=1$ and $4x-y=4$ intersect at the point with coordinates (a, b). What is the value of b?



37. A portion of the graph of a function f is shown above. The domain of f is the set of all real numbers. Which of the following could be the equation of f?

(A) $f(x)=-3\sin\left(\frac{x}{2}\right)$

(B) $f(x)=-3\sin\left(x-\frac{\pi}{2}\right)$

(C) $f(x)=-\cos(3x)$

(D) $f(x)=3\sin(2x-\pi)$

(E) $f(x)=3\cos\left(2x-\frac{\pi}{2}\right)$

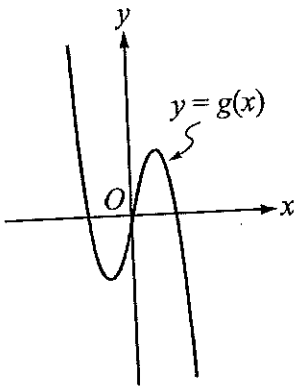
38. The function f is given by $f(x)=x+|x-10|$. Which of the following defines $f(x)$ for all $x\le 10$?

(A) $f(x)=10$
(B) $f(x)=-10$
(C) $f(x)=10-2x$
(D) $f(x)=-10+2x$
(E) $f(x)=-10-2x$

x	$f(x)$
5	a
10	32
15	b

39. The table above shows some values for the function f. If f is a linear function, what is the value of $a+b$?

(A) 32
(B) 42
(C) 48
(D) 64
(E) It cannot be determined from the information given.



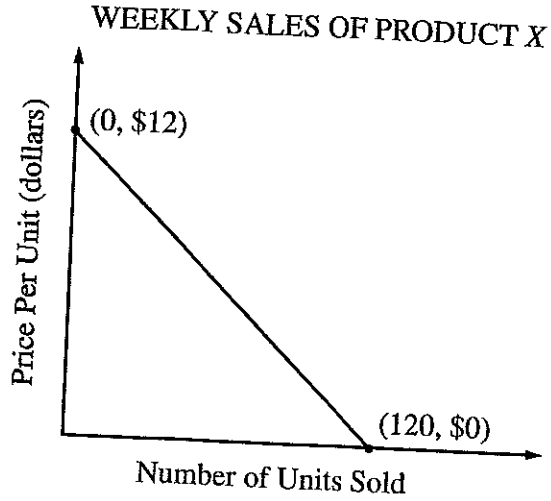
40. The figure above shows the graph of a polynomial function g. Which of the following could define $g(x)$?

(A) $g(x)=x^3-4$
(B) $g(x)=x^3-4x$
(C) $g(x)=-x^3+4x$
(D) $g(x)=x^4-4x^2$
(E) $g(x)=-x^4+4x^2$

41. If a and b are numbers such that $\ln a = 2.1$ and $\ln b = 1.4$, what is the value of $\ln\left(\frac{a^2}{b}\right)$?

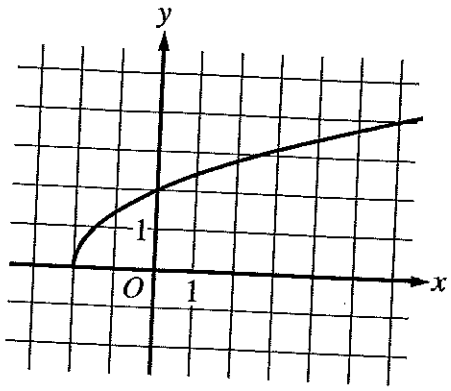
42. If $0<\theta<\frac{\pi}{2}$ and $10\sin\theta = z$, what is $\tan\theta$ in terms of z?

(A) $\frac{z}{\sqrt{100-z^2}}$
(B) $\frac{10}{\sqrt{z^2-100}}$
(C) $\frac{\sqrt{100-z^2}}{10}$
(D) $\frac{\sqrt{z^2-100}}{10}$
(E) $\frac{\sqrt{100-z^2}}{z}$



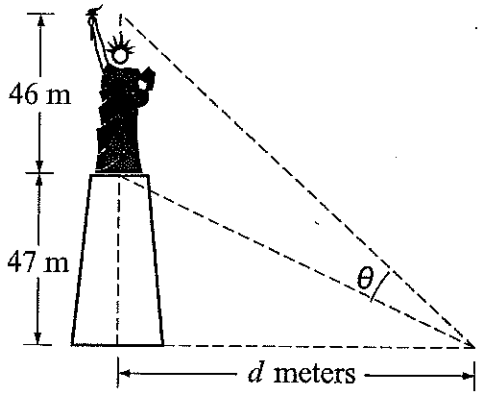
43. Based on past sales, a convenience store has observed a linear relationship between the number of units of Product X that will be sold to customers each week and the price per unit. The figure above models this linear relationship. Based on the model, how many dollars would the convenience store expect to earn from its sales of Product X in a week when the price per unit is \$5 ?

(A) \$125
(B) \$250
(C) \$350
(D) \$600
(E) \$720



44. The figure above shows the graph of the function f defined by $f(x)=\sqrt{2x+4}$. If f^{-1} is the inverse function of f, what is the value of $f^{-1}(2)$?

(A) $-\sqrt{8}$
(B) -2
(C) 0
(D) $\frac{1}{\sqrt{8}}$
(E) $\sqrt{8}$



45. The Statue of Liberty is 46 meters tall and stands on a pedestal that is 47 meters above the ground. An observer is located d meters from the pedestal and is standing level with the base, as shown in the figure above. Which of the following best expresses the angle θ in terms of d ?

(A) $\theta = \arcsin\left(\frac{47}{d}\right) - \arcsin\left(\frac{46}{d}\right)$

(B) $\theta = \arcsin\left(\frac{93}{d}\right) - \arcsin\left(\frac{47}{d}\right)$

(C) $\theta = \arctan\left(\frac{47}{d}\right) - \arctan\left(\frac{46}{d}\right)$

(D) $\theta = \arctan\left(\frac{d}{93}\right) - \arctan\left(\frac{d}{47}\right)$

(E) $\theta = \arctan\left(\frac{93}{d}\right) - \arctan\left(\frac{47}{d}\right)$

46. The value of $\log(1{,}732)$ is between what two integers?

(A) 2 and 3
(B) 3 and 4
(C) 4 and 5
(D) 17 and 18
(E) 173 and 174

47. In the xy-plane, which of the following is an equation of a vertical asymptote to the graph of $y = \sec(6x - \pi)$?

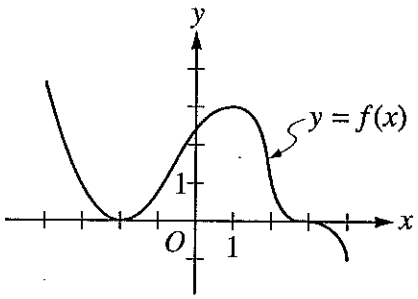
(A) $x = \frac{\pi}{6}$

(B) $x = \frac{\pi}{4}$

(C) $x = \frac{\pi}{3}$

(D) $x = \frac{\pi}{2}$

(E) $x = \pi$



48. The figure above shows the graph of a polynomial function f. What is the least possible degree of f?

(A) Two
(B) Three
(C) Four
(D) Five
(E) Six

$$x - y = 1$$
$$x^2 + y^2 = 5$$

49. The point (x, y) lies in the third quadrant of the xy-plane and satisfies the equations above. What is the value of y ?

50. For all $x \neq 0$, the function f is defined by $f(x) = \frac{x}{|x|}$. What is the range of f?

(A) –1 and 1 only
(B) All real numbers between –1 and 1, inclusive
(C) All real numbers greater than or equal to 0
(D) All real numbers except 0
(E) All real numbers

51. $\tan^{-1}\left(2\cos\frac{\pi}{3}\right) =$

(A) $\frac{\pi}{4}$
(B) $\frac{\pi}{3}$
(C) $\frac{\pi}{2}$
(D) $\frac{2\pi}{3}$
(E) $\frac{3\pi}{2}$

52. In the xy-plane, the graph of $y = x\left(x^2-2\right)\left(x^2+x+1\right)$ intersects the x-axis in how many different points?

(A) One
(B) Two
(C) Three
(D) Four
(E) Five

53. For all x such that $0 < x < \frac{\pi}{2}$, which of the following is equivalent to $\frac{\sin(2x)}{\sin x} - \frac{\cos(2x)}{\cos x}$?

(A) $\frac{1}{\cos x}$
(B) $\sin x - \cos x$
(C) $2\cos x - 2\sin x$
(D) $\frac{1}{\sin x} - \frac{1}{\cos x}$
(E) 0

54. The population P of fish, in thousands, in a certain pond at time t years is modeled by the function $P(t)=\dfrac{1}{1+\left(\dfrac{1}{P_0}-1\right)e^{-rt}}$, where P_0 is the population at time $t=0$ and r is the growth rate of the population. If $P(1)=5$, which of the following is equivalent to r?

(A) $\dfrac{\ln(5)}{P_0}$

(B) $\dfrac{\ln(5)}{\ln\left(\dfrac{1}{P_0}\right)}$

(C) $\ln\left(\dfrac{4P_0}{5}\right)$

(D) $\ln\left(\dfrac{4}{5P_0}\right)$

(E) $\ln\left(\dfrac{5(P_0-1)}{4P_0}\right)$

55. What are all solutions of the equation $\cos(2x)+1=\sin(2x)$ in the interval $[0,2\pi)$?

(A) $\dfrac{\pi}{2}$ and π

(B) $\dfrac{\pi}{2}$, π, and $\dfrac{3\pi}{2}$

(C) $\dfrac{\pi}{4}$, $\dfrac{\pi}{2}$, $\dfrac{5\pi}{4}$, and $\dfrac{3\pi}{2}$

(D) $\dfrac{\pi}{4}$, $\dfrac{\pi}{2}$, $\dfrac{3\pi}{4}$, $\dfrac{5\pi}{4}$, $\dfrac{3\pi}{2}$, and $\dfrac{7\pi}{2}$

(E) $\dfrac{\pi}{8}$, $\dfrac{\pi}{4}$, $\dfrac{3\pi}{4}$, $\dfrac{7\pi}{8}$, $\dfrac{7\pi}{4}$, and $\dfrac{15\pi}{8}$

Study Resources

Most textbooks used in college-level precalculus courses cover the topics in the outline given earlier, but the approaches to certain topics and the emphases given to them may differ. To prepare for the Precalculus exam, it is advisable to study one or more college textbooks, which can be found in most college bookstores. When selecting a textbook, check the table of contents against the knowledge and skills required for this test.

Visit clep.collegeboard.org/test-preparation for additional precalculus resources. You can also find suggestions for exam preparation in Chapter IV of the *Official Study Guide*. In addition, many college faculty post their course materials on their schools' websites.

Answer Key

Section 1		Section 2	
1.	See below	28.	D
2.	B	29.	C
3.	D	30.	E
4.	C	31.	80,000
5.	C	32.	A
6.	5.28	33.	D
7.	D	34.	D
8.	D	35.	E
9.	A	36.	−0.4
10.	B	37.	D
11.	A	38.	A
12.	D	39.	D
13.	B	40.	C
14.	7	41.	2.8
15.	C	42.	A
16.	D	43.	C
17.	2.14	44.	C
18.	D	45.	E
19.	A	46.	B
20.	C	47.	B
21.	A	48.	D
22.	D	49.	−2
23.	D	50.	A
24.	91	51.	A
25.	A	52.	C
26.	D	53.	A
27.	0.5	54.	E
		55.	C

1.

Function	Even	Odd	Neither
$f(x)=\frac{e^x+e^{-x}}{2}$	√		
$g(x)=\lvert\sin x\rvert$	√		
$h(x)=8x^4+4x^2+2x$			√