Practice Test 1

50 Questions (1 hour)

Directions: For each question, choose the BEST answer from the choices given. If the precise answer is not among the choices, choose the one that best approximates the answer. Then fill in the corresponding oval on the answer sheet.

Notes:

(1) To answer some of these questions, you will need a calculator. You must use at least a scientific calculator, but programmable and graphing calculators are also allowed.

(2) Make sure your calculator is in the correct mode (degree or radian) for the question being asked.

(3) Figures in this test are drawn as accurately as possible UNLESS it is stated in a specific question that the figure is not drawn to scale. All figures are assumed to lie in a plane unless otherwise specified.

(4) 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, unless otherwise indicated.

Reference Information: Use the following formulas as needed.

Right circular cone: If r = radius and h = height, then Volume = $\frac{1}{3}\pi r^2 h$; and if c = circumference of the base and ℓ = slant height, then Lateral Area = $\frac{1}{2}c\ell$.

Sphere: If r = radius, then Volume = $\frac{4}{3}\pi r^3$ and Surface Area = $4\pi r^2$.

Pyramid: If B = area of the base and h = height, then Volume = $\frac{1}{3}Bh$.

1. If $x^3 = 7^5$, what is the value of x?

(A) 3.2
(B) 11.6
(C) 25.6
(D) 243.0
(E) 26,041.6

2. If $a \Delta b \Delta c = \frac{ab}{c}$, which of the following equals 5?

(A) $4 \Delta 3 \Delta 2$
(B) $5 \Delta 2 \Delta 5$
(C) $6 \Delta 4 \Delta 2$
(D) $8 \Delta 4 \Delta 2$
(E) $10 \Delta 2 \Delta 4$

3. If $f(x) = e^x$ and $g(x) = \frac{x}{2}$, then $g(f(2)) =$

(A) 2.7
(B) 3.7
(C) 4.2
(D) 5.4
(E) 6.1

4. If $\frac{x+2y}{y} = 5$, what is the value of $\frac{y}{x}$?

(A) –3 (B) $-\frac{1}{3}$ (C) $\frac{1}{3}$ (D) 3 (E) 4

DO YOUR FIGURING HERE.

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5. In Figure 1, if $\cos\theta = 0.75$, $\tan\theta =$

(A) 0.60 (B) 0.67 (C) 0.75 (D) 0.88 (E) 1.33

6. Which of the following is an equation of the line that has a y-intercept of 6 and an x-intercept of -2?

(A) $3x - y = 6$
(B) $3x - y = -6$
(C) $3x + y = 6$
(D) $6x + y = 3$
(E) $6x - y = 3$

7. For all $y \neq 0$, $\frac{1}{y} + \frac{1}{2y} + \frac{1}{3y} =$

(A) $\frac{1}{2y}$

(B) $\frac{1}{6y}$

(C) $\frac{5}{6y}$

(D) $\frac{11}{6y}$

(E) $\frac{1}{6y^3}$

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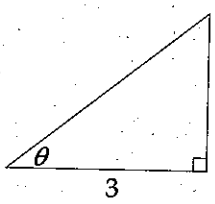

Figure 1

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8. In a class of 10 boys and 15 girls, the average score on a biology test is 90. If the average score for the girls is x, what is the average score for the boys in terms of x?

(A) $200 - \frac{2}{3}x$

(B) $225 - \frac{3}{2}x$

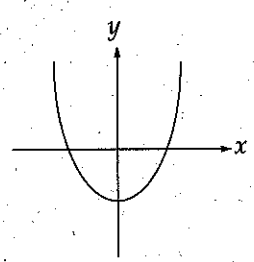
(C) $250 - 2x$

(D) $250 - 3x$

(E) $275 - 2x$

9. Which of the following graphs is symmetric about the origin?

(A)



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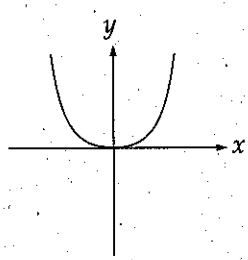

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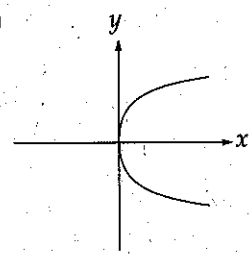

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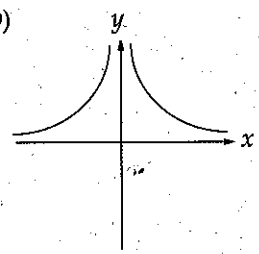

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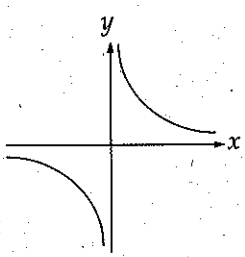

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10. George is going on vacation and wishes to take along 2 books to read. If he has 5 different books to choose from, how many different combinations of 2 books can he bring?

(A) 2 (B) 5 (C) 10 (D) 15 (E) 20

11. If $\sqrt{3-x}-x=3, x=$

(A) –1 or –6
(B) 1 or –6
(C) –1 only
(D) –6 only
(E) There is no solution.

12. The lines with the equations $y=m_1x+4$ and $y=m_2x+3$ will intersect to the right of the y-axis if and only if

(A) $m_1=m_2$
(B) $m_1<m_2$
(C) $m_1>m_2$
(D) $m_1+m_2=0$
(E) $m_1\neq m_2$

13. If the probability that it will rain sometime on Monday is $\frac{1}{3}$ and the independent probability that it will rain sometime on Tuesday is $\frac{1}{2}$, what is the probability that it will rain on both days?

(A) $\frac{1}{6}$ (B) $\frac{1}{5}$ (C) $\frac{1}{3}$ (D) $\frac{2}{5}$ (E) $\frac{5}{6}$

DO YOUR FIGURING HERE.

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14. If $\sin 2A = \frac{1}{2}$, then $\frac{1}{2\sin A \cos A} =$

(A) 1 (B) $\frac{3}{2}$ (C) 2 (D) 3 (E) 4

15. What values for x would make $\frac{1}{\sqrt{x+1}}$ undefined?

(A) –1 only
(B) 1 only
(C) All real numbers greater than –1
(D) All real numbers less than –1
(E) All real numbers less than or equal to –1

16. If $-2 \leq x \leq 2$, the maximum value of $f(x) = 1 - x^2$ is

(A) 2 (B) 1 (C) 0 (D) –1 (E) –2

17. If $f(x) = 1 - 4x$, and $f^{-1}(x)$ is the inverse of $f(x)$, then $f(-3)\, f^{-1}(-3) =$

(A) 1 (B) 3 (C) 4 (D) 10 (E) 13

18. Which of the following polynomials, when divided by $3x + 4$, equals $2x^2 + 5x - 3$ with remainder 3?

(A) $6x^3 + 23x^2 - 11x - 12$
(B) $6x^3 + 23x^2 - 11x - 9$
(C) $6x^3 + 23x^2 - 11x - 15$
(D) $6x^3 + 23x^2 + 11x - 12$
(E) $6x^3 + 23x^2 + 11x - 9$

DO YOUR FIGURING HERE.

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19. Let $\lfloor x \rfloor$ be defined to be the "floor" of x, where $\lfloor x \rfloor$ is the greatest integer that is less than or equal to x, and let $\lceil x \rceil$ be the "ceiling" of x, where $\lceil x \rceil$ is the least integer that is greater than or equal to x. If $f(x) = \lceil x \rceil + \lfloor x \rfloor$ and x is not an integer, then $f(x)$ is also equal to

(A) $2\lceil x \rceil - 2$
(B) $2\lceil x \rceil$
(C) $2\lfloor x \rfloor$
(D) $2\lfloor x \rfloor + 1$
(E) $2\lfloor x \rfloor + 2$

20. If $\log_2 x + \log_2 x = 7$, then $x =$

(A) 1.21 (B) 1.40 (C) 11.31 (D) 18.52 (E) 22.63

21. If $f(x) = \dfrac{\sqrt{x-1}}{x}$, what is the domain of $f(x)$?

(A) All real numbers except for 0
(B) All real numbers greater than or equal to 1
(C) All real numbers less than or equal to 1
(D) All real numbers greater than or equal to –1 but less than or equal to 1
(E) All real numbers less than or equal to –1

22. How many ways can 2 identical red chairs and 4 identical blue chairs be arranged in one row?

(A) 6 (B) 15 (C) 21 (D) 24 (E) 30

DO YOUR FIGURING HERE.

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23. If $a + b > 0$ and $c + d > 0$, which of the following must be true?

(A) $a + b + c > 0$
(B) $ac + bd > 0$
(C) $a^2 + b^2 > 0$
(D) $d(a + b) > 0$
(E) $a + b > c + d$

24. If $x > 0$, $a = x \cos \theta$, and $b = x \sin \theta$, then $\sqrt{a^2 + b^2} =$

(A) 1
(B) x
(C) $2x$
(D) $x (\cos \theta + \sin \theta)$
(E) $x \cos \theta \sin \theta$

25. If $0° < x < 90°$ and $5 \sin^2 x = 7 \sin x - 2$, what is the value of $\sin x$?

(A) 1.00 (B) 0.71 (C) 0.40 (D) 0.38 (E) 0.35

26. $3 - 2i$ and $3 + 2i$ are roots to which of the following quadratic equations?

(A) $x^2 + 6x + 13 = 0$
(B) $x^2 - 6x + 13 = 0$
(C) $x^2 - 6x - 13 = 0$
(D) $x^2 + 6x + 7 = 0$
(E) $x^2 + 6x - 4 = 0$

27. In Figure 2, if point P is located on the unit circle, then $x + y =$

(A) 0.37 (B) 0.50 (C) 0.78 (D) 0.87 (E) 1.37

DO YOUR FIGURING HERE.

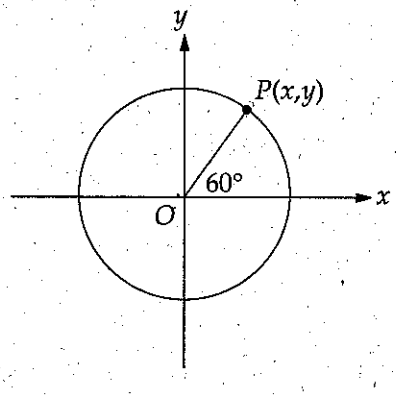

Figure 2

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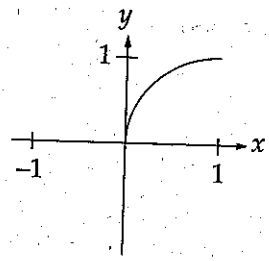
28. If $0 \leq t \leq 1$, which of the following graphs is the graph of y versus x where x and y are related by the parametric equations $y = t^2$ and $x = \sqrt{t}$?

(A)



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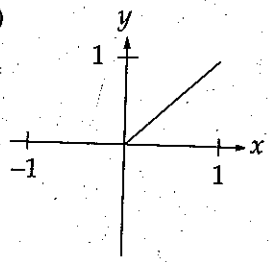
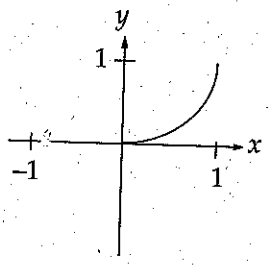


(C)



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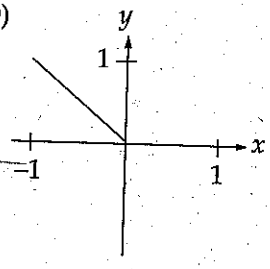
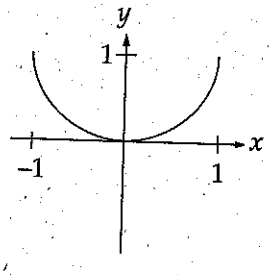


(E)



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29. In Figure 3, if isosceles right triangle ABC and square $ACDE$ share side AC, what is the degree measure of angle EBC?

(A) 27 (B) 30 (C) 60 (D) 63 (E) 75

30. In Figure 4, which of the following denotes the correct vector arithmetic?

(A) $\vec{x} + \vec{y} = \vec{z}$
(B) $\vec{y} + \vec{z} = \vec{x}$
(C) $\vec{x} + \vec{z} = \vec{y}$
(D) $\vec{z} - \vec{x} = \vec{y}$
(E) $\vec{z} - \vec{y} = \vec{x}$

31. The horizontal distance, in feet, of a projectile that is fired with an initial velocity v, in feet per second, at an angle θ with the horizontal, is given by

$$H(v, \theta) = \frac{v^2 \sin(2\theta)}{32}$$

If a football is kicked at an angle of 50 degrees with the horizontal and an initial velocity of 30 feet per second, what is the horizontal distance, in feet, from the point where the football is kicked to the point where the football first hits the ground?

(A) 28 (B) 30 (C) 33 (D) 36 (E) 39

32. If a right circular cone has a lateral surface area of 6π and a slant height of 6, what is the radius of the base?

(A) 0.50
(B) 0.75
(C) 1.00
(D) 1.25
(E) 1.50

DO YOUR FIGURING HERE.

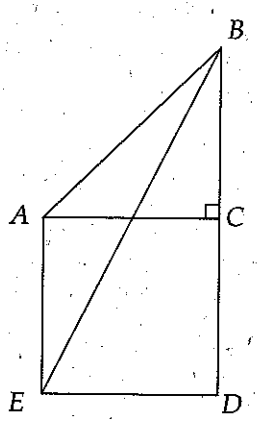

Figure 3

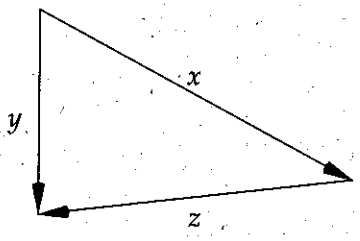

Figure 4

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33. If two fair dice are tossed, what is the probability that the two numbers that turn up are consecutive integers?

(A) 0.14 (B) 0.17 (C) 0.28 (D) 0.33 (E) 0.50

34. Which of the following is an equation of the ellipse centered at (–2,3) with a minor axis of 4 parallel to the x-axis and a major axis of 6 parallel to the y-axis?

(A) $\frac{(x-2)^2}{4}+\frac{(y-3)^2}{9}=1$

(B) $\frac{(x+2)^2}{4}+\frac{(y-3)^2}{9}=1$

(C) $\frac{(x-2)^2}{4}+\frac{(y+3)^2}{9}=1$

(D) $\frac{(x+2)^2}{4}+\frac{(y+3)^2}{9}=1$

(E) $\frac{(x-2)^2}{9}+\frac{(y+3)^2}{4}=1$

35. If $f(x) \geq 0$ and $g(x) \geq 0$ for all real x, which of the following statements must be true?

I. $f(x) + g(x) \geq 0$

II. $f(x) - g(x) \geq 0$

III. $f(x)g(x) \geq 0$

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

DO YOUR FIGURING HERE.

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36. Where defined, $\frac{1-\sin\theta}{1-\csc\theta} =$

(A) $\sin\theta$
(B) $\csc\theta$
(C) $-\sin\theta$
(D) $-\csc\theta$
(E) $-\cos\theta$

37. $\sum_{k=0}^{5}(-1)^k 2k$

(A) –10 (B) –6 (C) 0 (D) 6 (E) 10

38. If $f(x) = x^3$, which of the following must be true?

(A) $f(-x) = f(x)$
(B) $f(-x) = -f(-x)$
(C) $f(-x) = -f(x)$
(D) $f(x) = -f(x)$
(E) $f(x) > f(-x)$

39. $\lim_{x\to 1}\frac{x^2-6x+5}{x^2+3x-4} =$

(A) –1.25
(B) –0.80
(C) 0.80
(D) 1.25
(E) The limit does not exist.

40. If Figure 5 shows the graph of $f(x)$, what is the value of $f(f(3))$?

(A) –4
(B) –2
(C) 0
(D) 1
(E) 3

DO YOUR FIGURING HERE.

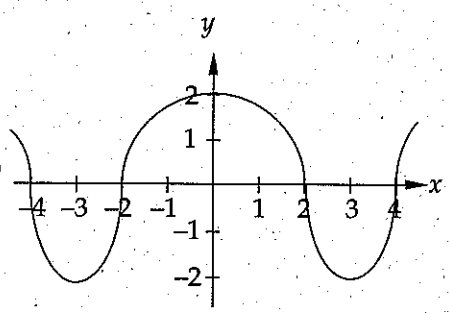

Figure 5

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41. If all the terms of a geometric series are positive, the first term of the series is 2, and the third term is 8, how many digits are there in the 40th term?

(A) 10
(B) 11
(C) 12
(D) 13
(E) 14

42. In Figure 6, what is the degree measure, to the nearest integer, of angle ABO ?

(A) 50
(B) 48
(C) 45
(D) 43
(E) 40

43. If $\log_2(x-16) = \log_4(x-4)$, which of the following could be the value of x ?

(A) 12 (B) 13 (C) 16 (D) 20 (E) 24

44. If a sphere of radius 3 is inscribed in a cube such that it is tangent to all six faces of the cube, the volume contained outside the sphere and inside the cube is

(A) 97 (B) 103 (C) 109 (D) 115 (E) 121

45. If $f(x) = \sin(\arctan x)$, $g(x) = \tan(\arcsin x)$, and $0 \leq x < \frac{\pi}{2}$, then $f\left(g\left(\frac{\pi}{10}\right)\right) =$

(A) 0.314
(B) 0.354
(C) 0.577
(D) 0.707
(E) 0.866

DO YOUR FIGURING HERE.

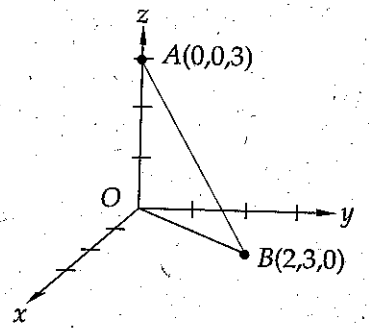

Figure 6

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46. If $f(x) = \frac{1}{(x+1)!}$, what is the smallest integer x such that $f(x) < 0.000005$?

(A) 7 (B) 8 (C) 9 (D) 10 (E) 11

47. In Figure 7, point O has coordinates (0,0), point P lies on the graph of $y = 6 - x^2$, and point B has coordinates $(2\sqrt{3},0)$. If $OP = BP$, the area of triangle OPB is

(A) 1.7
(B) 3.0
(C) 3.5
(D) 4.7
(E) 5.2

48. If $\cos 2x = \sin x$, and x is in radians, which of the following is a possible value of x ?

(A) 0.39 (B) 0.52 (C) 1.05 (D) 1.60 (E) 2.09

49. In Figure 8, if a wooden right circular cylinder with radius 2 meters and height 6 meters has a cylindrical hole of diameter 2 meters drilled through the center as shown, what is the entire surface area (including the top and bottom faces), in square meters, of the resulting figure?

(A) 38π
(B) 40π
(C) 42π
(D) 44π
(E) 46π

50. What is the greatest possible number of points of intersection between a parabola and a circle?

(A) 2 (B) 3 (C) 4 (D) 6 (E) 8

DO YOUR FIGURING HERE.

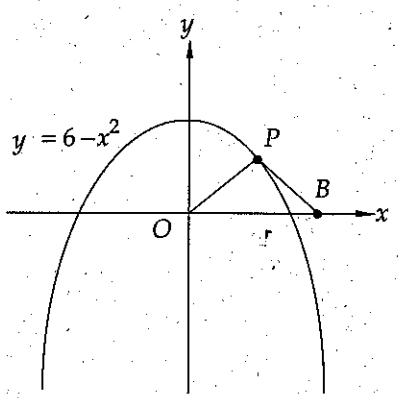

Figure 7

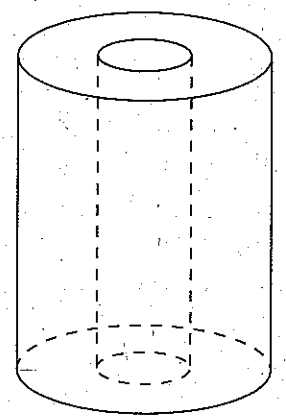

Figure 8

STOP!

If you finish before time is up, you may check your work.

Turn the page
for answers and explanations
to Practice Test 1.

Answer Key
Practice Test 1

1. C
2. E
3. B
4. C
5. D
6. B
7. D
8. B
9. E
10. C
11. C
12. B
13. A
14. C
15. E
16. B
17. E
18. E
19. D
20. C
21. B
22. B
23. C
24. B
25. C
26. B
27. E
28. C
29. A
30. C
31. A
32. C
33. C
34. B
35. E
36. C
37. B
38. C
39. B
40. C
41. D
42. E
43. D
44. B
45. A
46. B
47. E
48. B
49. C
50. C