

# Practice Test 4

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  $\ell$  = 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  $|2x - 4| \geq \frac{x}{4}$ , which of the following statements must be true?

(A)  $x \geq \frac{9}{16}$  or  $x = \frac{16}{7}$

(B)  $x \geq \frac{9}{16}$  or  $x \leq \frac{7}{16}$

(C)  $\frac{16}{9} < x < \frac{16}{7}$

(D)  $\frac{7}{16} \leq x \leq \frac{9}{16}$

(E)  $x \geq \frac{16}{7}$  or  $x \leq \frac{16}{9}$

2.  $f(x) = |4x| - 2x^3$ . If  $f(a) = 66$ , which of the following could be the value of  $a$ ?

(A) -6

(B) -4

(C) -3

(D) 3

(E) 6

3. If  $x \geq 4$ ,  $A^2 = x^2 + 12x + 36$ , and  $B^2 = 4x^2 - 28x + 49$ , then  $(A + B)^2 =$

(A)  $2x^2 + 5x + 42$

(B)  $3x^2 - 9x - 1$

(C)  $4x^2 - x + 13$

(D)  $5x^2 - 26x + 85$

(E)  $9x^2 - 6x + 1$

DO YOUR FIGURING HERE.

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4.  $f(x) = 3x^{\frac{2}{3}}$   
 $f(64) =$
- (A) 48  
(B) 128  
(C) 256  
(D) 1,204  
(E) 2,304
5. A circle with center (3,8) contains the point (2,-1). Which of the following is also a point on the circle?
- (A) (1,-10)  
(B) (4,17)  
(C) (5,-9)  
(D) (7,15)  
(E) (9,6)
6. For all  $y \neq 5$ ,  $\frac{y^3 - 6y^2 + 3y + 10}{y^2 - 10y + 25} =$
- (A)  $\frac{y^2 - y + 2}{y + 5}$   
(B)  $\frac{y^2 - y - 2}{y - 5}$   
(C)  $\frac{y^2 + y - 2}{y + 5}$   
(D)  $\frac{y^2 + y - 2}{y - 5}$   
(E)  $\frac{y^2 - y + 2}{y - 5}$

DO YOUR FIGURING HERE.

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7. Which of the following functions has a domain of  $x \leq 3$ ?

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

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

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

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

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

8. If  $x^2 - 8x + 13 = 0$ ,  $x =$

(A)  $-4 \pm \sqrt{3}$

(B)  $-4 \pm 2\sqrt{3}$

(C)  $4 \pm \sqrt{3}$

(D)  $4 \pm 3\sqrt{2}$

(E)  $4 \pm 2\sqrt{2}$

9. What is the perimeter of a triangle with vertices at coordinates  $(-2,3)$ ,  $(4,3)$ , and  $(6,-3)$ ?

(A)  $4\sqrt{11}$

(B)  $18\sqrt{10}$

(C)  $10 + 4\sqrt{5}$

(D)  $16 + 2\sqrt{10}$

(E)  $16 + 3\sqrt{7}$

10.  $f(x) = x + 4$

$g(x) = 6 - x^2$

What is the maximum value of  $g(f(x))$ ?

(A)  $-6$

(B)  $-4$

(C)  $2$

(D)  $4$

(E)  $6$

DO YOUR FIGURING HERE.

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11. If  $x^{\frac{3}{2}} = 27$ ,  $x^{\frac{5}{2}} =$
- (A) 27  
(B) 81  
(C) 243  
(D) 729  
(E) 2,181
12. Which of the following lines intersects  $y = \frac{x}{3} + 5$  at (9,8) and does not intersect the line  $y = -3x - 7$ ?
- (A)  $y = -3x + 13$   
(B)  $y = -3x + 35$   
(C)  $y = -\frac{x}{3} + 8$   
(D)  $y = -\frac{x}{3} + 11$   
(E)  $y = \frac{x}{3} - 7$
13. In the right triangle in Figure 1, if  $\theta = 67^\circ$ , what is the value of  $x$ ?
- (A) 2.9  
(B) 7.6  
(C) 16.5  
(D) 17.9  
(E) 18.2
14. What is the minimum value of  $f(x) = |2x - 5| + 6$ ?
- (A) 2  
(B) 3  
(C) 5  
(D) 6  
(E) 8

DO YOUR FIGURING HERE.

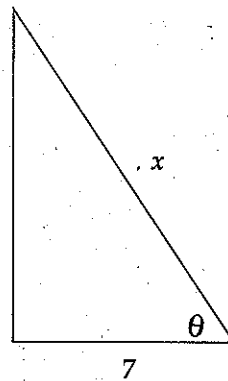


Figure 1

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15. If  $\frac{n^n}{n!} = \frac{nx}{(n-1)!}$ ,  $x =$

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

16.  $\frac{ac+b^2}{bc} =$

- (A)  $\frac{a}{b} + c$
- (B)  $1 + \frac{ab}{c}$
- (C)  $\frac{a}{c} + b$
- (D)  $\frac{a}{b} + \frac{b}{c}$
- (E)  $\frac{a}{b} + \frac{c}{a}$

17. The domain of  $f(x) = \frac{4}{|x|-x}$  is

- (A)  $x < -4$
- (B)  $x > 0$
- (C)  $x < 0$
- (D)  $x > 1$
- (E)  $x > 4$

18. A square is formed by the points (4,5), (12,5), (12,-3), and (4,-3). The diagonals of the square intersect at which of the following points?

- (A) (8,5)
- (B) (9,6)
- (C) (8,1)
- (D) (12,1)
- (E) (16,2)

DO YOUR FIGURING HERE.

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19. If  $s = t + \sqrt{\frac{r^3}{q}}$ , what is the value of  $r$  in terms of  $q$ ,  $s$ , and  $t$ ?

- (A)  $\sqrt[3]{qs^2 - qt}$   
 (B)  $\sqrt[3]{\frac{s^2 - 2st - t^2}{q}}$   
 (C)  $\sqrt[3]{qs^2 - 2qst + qt^2}$   
 (D)  $\sqrt{\frac{qs^2 + 2qst - t^2}{3}}$   
 (E)  $\frac{qs^2 - 2st + t^2}{3}$

20. The hyperbola  $\frac{x^2 + 4x + 4}{25} - \frac{y^2 - 6x + 9}{16} = 1$  is centered at which of the following points?

- (A)  $(-4, -9)$   
 (B)  $(-2, 3)$   
 (C)  $(2, -3)$   
 (D)  $(5, 4)$   
 (E)  $(25, 16)$

21. If  $3^n = n^6$ ,  $n^{18} =$

- (A)  $3^n n^3$   
 (B)  $3^n n^{12}$   
 (C)  $9^n$   
 (D)  $3^{12n}$   
 (E)  $3^{n+12}$

22. What is the domain of  $f(x) = \sqrt{(4-x)^2 - 5}$ ?

- (A)  $x \leq -3$  or  $x \geq 7$   
 (B)  $2 - \sqrt{5} \leq x \leq 2 + \sqrt{5}$   
 (C)  $x \leq 4 - \sqrt{5}$  or  $x \geq 4 + \sqrt{5}$   
 (D)  $4 - \sqrt{5} \leq x \leq 4 + \sqrt{5}$   
 (E)  $x \leq 21$  or  $x \geq 29$

DO YOUR FIGURING HERE.

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23. If one solution of  $x^2 - 22x + d = 0$  is 6, which of the following could be the value of  $d$ ?

(A) 36  
(B) 48  
(C) 72  
(D) 96  
(E) 108

24. Which line has a slope of  $\frac{5}{3}$ ?

(A)  $3x - 5y + 2 = 0$   
(B)  $3x + 5y + 6 = 0$   
(C)  $3x - 4y + 5 = 0$   
(D)  $5x + 3y + 8 = 0$   
(E)  $5x - 3y + 4 = 0$

25. What is the range of  $f(x) = x^3 - \sqrt{-x - 6}$ ?

(A) All real numbers less than or equal to -222  
(B) All real numbers less than or equal to -216  
(C) All real numbers greater than or equal to -216  
(D) All real numbers greater than or equal to 216  
(E) All real numbers greater than or equal to 222

26. A cone has a slant height of 8 and a lateral area of  $48\pi$ . What is the radius of the base of the cone?

(A) 3  
(B) 6  
(C) 12  
(D) 16  
(E) 24

DO YOUR FIGURING HERE.

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27. If  $f(x) = 4x - 3$  and  $g(x) = x - 4$ , which of the following has a value of  $-11$ ?

(A)  $f(g(2))$   
(B)  $g(f(2))$   
(C)  $g(f(3))$   
(D)  $f(g(3))$   
(E)  $f(g(4))$

28. What is the length of side  $AC$  in Figure 2?

(A) 10.77  
(B) 10.83  
(C) 10.89  
(D) 13.16  
(E) 17.90

29. What is the range of  $f(x) = -7\sin \frac{x}{8}$ ?

(A) All real numbers greater than or equal to  $-7$  and less than or equal to  $7$   
(B) All real numbers greater than or equal to  $-7$  and less than or equal to  $0$   
(C) All real numbers greater than or equal to  $0$  and less than or equal to  $8$   
(D) All real numbers greater than or equal to  $0$  and less than or equal to  $\frac{1}{8}$   
(E) All real numbers greater than or equal to  $-\frac{1}{8}$  and less than or equal to  $\frac{1}{8}$

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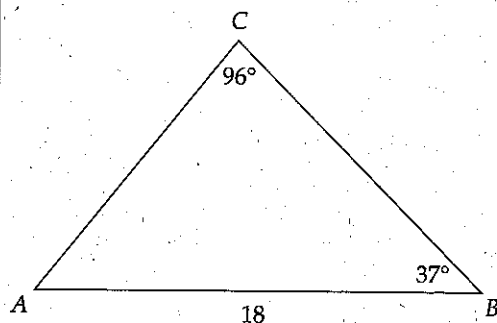


Figure 2

Note: Figure not drawn to scale.

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30. In the triangular solid shown in Figure 3, points  $A$  and  $B$  are vertices. The triangular faces are isosceles. The solid has a height of 12, a length of 21, and a width of 18. What is the distance between  $A$  and  $B$ ?

(A)  $9\sqrt{5}$   
 (B)  $3\sqrt{58}$   
 (C)  $3\sqrt{74}$   
 (D)  $3\sqrt{85}$   
 (E)  $6\sqrt{11}$

31. If  $\sin^2 x = a$  and  $\cos^2 x = b$ , then  $\sin 2x + \cos 2x =$

(A)  $2\sqrt{ab} + b - a$   
 (B)  $2ab + a^2 - b^2$   
 (C)  $2\sqrt{ab} + 2a - 1$   
 (D)  $2ab + 2a - 1$   
 (E)  $2\sqrt{ab} - 2b + 1$

32. The mean number of tickets sold daily by a theater over a seven-day period was 52. The theater sold 46 tickets on the last day of that period. What was the mean number of tickets sold daily over the first six days?

(A) 53  
 (B) 54  
 (C) 55  
 (D) 56  
 (E) 57

33. The ratio of the surface area of sphere  $A$  to the surface area of sphere  $B$  is 729:1. What is ratio of the volume of sphere  $A$  to sphere  $B$ ?

(A) 27:1  
 (B) 81:1  
 (C) 19,683:1  
 (D) 26,224:1  
 (E) 531,441:1

DO YOUR FIGURING HERE.

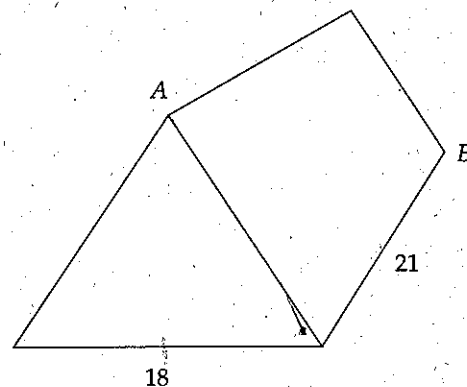


Figure 3

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34. If  $f(x) = \frac{2x}{5} + \frac{7}{3}$ ,  $f^{-1}(x) =$

(A)  $\frac{15}{6x+35}$

(B)  $\frac{6}{15x+35}$

(C)  $\frac{15x-6}{35}$

(D)  $\frac{15x-35}{6}$

(E)  $\frac{15-6x}{35}$

35. The graph of  $y = \cos \frac{x}{2}$  is shown in Figure 4. Point  $a$  has coordinates  $(t, 0)$ . What is the value of  $t$  in radians?

(A)  $\frac{2\pi}{3}$

(B)  $\frac{3\pi}{4}$

(C)  $\frac{3\pi}{2}$

(D)  $2\pi$

(E)  $3\pi$

36. The domain of which function does NOT include 2?

(A)  $f(x) = \frac{x^2 - 2x}{x^2 - 2x^3}$

(B)  $f(x) = \frac{x^{-2} - \frac{2}{x}}{x^2 - 2x^2}$

(C)  $f(x) = \frac{2x^2}{x^3 - 2x^2}$

(D)  $f(x) = \frac{x^2 - 2x}{x^2 - x}$

(E)  $f(x) = \frac{4x^2}{x^{-2} + 2x}$

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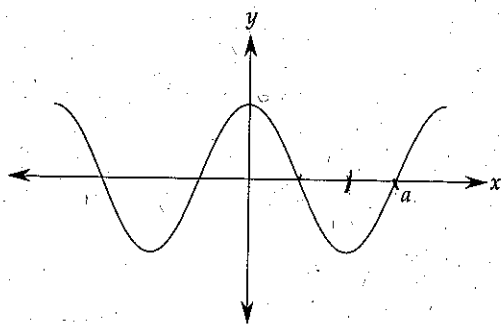


Figure 4

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37. The arithmetic sequence  $s = \{4, 7, 10, 13, n_5, n_6, \dots\}$ . Which step in the sequence involves a 12% increase over the immediately preceding term?

(A)  $n_5$  to  $n_6$   
(B)  $n_6$  to  $n_7$   
(C)  $n_7$  to  $n_8$   
(D)  $n_8$  to  $n_9$   
(E)  $n_9$  to  $n_{10}$

38. To what sum does the geometric series  $2.8 + 2.1 + 1.575 + \dots$  converge?

(A) 3.73  
(B) 4.97  
(C) 6.47  
(D) 11.20  
(E) 44.80

39.  $\frac{1 - \cos 40^\circ}{2} =$

(A)  $\cos^2 20^\circ$   
(B)  $\sin^2 20^\circ$   
(C)  $\tan 20^\circ$   
(D)  $\cos 80^\circ$   
(E)  $\tan^2 80^\circ$

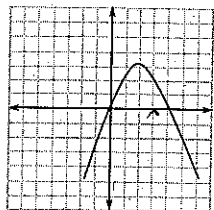
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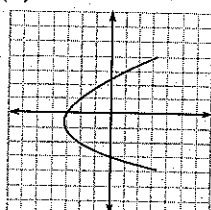
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40. Which of the following graphs is NOT a function?

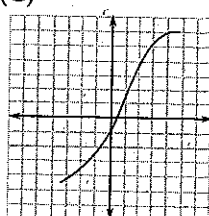
(A)



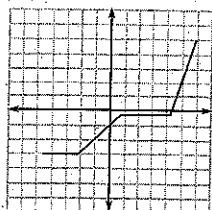
(B)



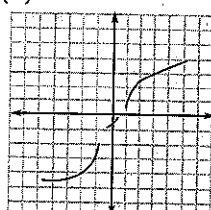
(C)



(D)



(E)



41. What is the angle measure of 4 radians?

- (A)  $114.591^\circ$
- (B)  $141.372^\circ$
- (C)  $229.183^\circ$
- (D)  $282.743^\circ$
- (E)  $458.366^\circ$

42. The median of the numbers  $n + 3, n + 7, \dots, n + 31, n + 35$  is 30. What is the value of  $n$ ?

- (A) 11
- (B) 14
- (C) 19
- (D) 27
- (E) 32

DO YOUR FIGURING HERE.

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43. If  $g(x) = (2x + 3)^2$ , then  $g\left(\frac{x}{3} - 1\right) =$

(A)  $\frac{4x^2}{9} + \frac{4x}{3} + 4$

(B)  $\frac{4x^2}{3} + 2x + 2$

(C)  $\frac{4x^2 + 2x}{3} + 1$

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

(E)  $\frac{4x^2 + 2x}{3} + 2$

44. What is the amplitude of  $y = 3 - 6\sin^2 x$ ?

(A) 2

(B) 3

(C) 4

(D) 6

(E) 12

45. A spinner has the numbers one through five evenly spaced. If the spinner is used three times, what is the probability that it will land on an odd number exactly once?

(A)  $\frac{12}{125}$

(B)  $\frac{18}{125}$

(C)  $\frac{27}{125}$

(D)  $\frac{36}{125}$

(E)  $\frac{54}{125}$

DO YOUR FIGURING HERE.

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46. What is the arithmetic mean of  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $2n$ , and  $m$ ?

(A)  $\frac{5+12n+6m}{24}$

(B)  $\frac{5+8n+4m}{24}$

(C)  $\frac{5+2n+m}{4}$

(D)  $\frac{5+12n+6m}{6}$

(E)  $\frac{5+2n+m}{12}$

47. Four letters mailed today each have a  $\frac{2}{3}$  probability of arriving in two days or sooner. What is the probability that exactly two of the four letters will arrive in two days or sooner?

(A)  $\frac{4}{81}$

(B)  $\frac{16}{81}$

(C)  $\frac{6}{27}$

(D)  $\frac{8}{27}$

(E)  $\frac{4}{9}$

48. Paula jogged for a total of 30 minutes. Her average speed for the first 10 minutes was 5 miles per hour. During the remainder of her time, she jogged 2.5 miles. What was Paula's average speed for her entire jog?

(A)  $6\frac{1}{2}$  mph

(B)  $6\frac{2}{3}$  mph

(C)  $7\frac{1}{2}$  mph

(D)  $7\frac{1}{3}$  mph

(E)  $7\frac{2}{3}$  mph

DO YOUR FIGURING HERE.

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49. The front row of an auditorium has 28 seats. Each of the remaining rows has 3 more seats than the row in front of it. If the auditorium has 32 rows, how many seats does it have?

(A) 1,440  
(B) 2,384  
(C) 2,688  
(D) 2,784  
(E) 3,552

50. Charles put \$1,000 in a savings account that earns 2% compound interest each year. The account would earn approximately \$126 in how many years?

(A) 5  
(B) 6  
(C) 7  
(D) 8  
(E) 9

**DO YOUR FIGURING HERE.**

**STOP!**

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



**Turn the page  
for answers and explanations  
to Practice Test 4.**

# Answer Key

## Practice Test 4

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