Name: _____   **Date:** _____
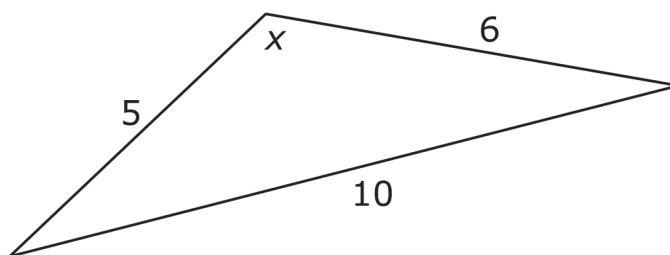
1. What is the *approximate* measure of angle x in the triangle below?

 A. $60.3°$ **B.** $80.4°$ **C.** $117.1°$ **D.** $130.5°$

2.
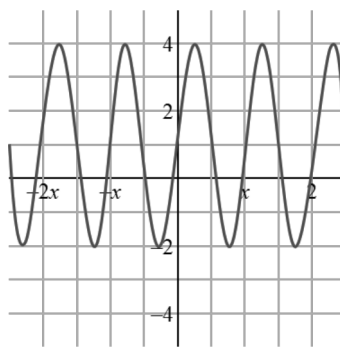
 Which of the following equations can be used to describe the graph shown above?

 A. $y = 4\sin 2(x - 1)$ **B.** $y = 3\sin(2x) + 1$ **C.** $y = 2\sin(3x) + 1$ **D.** $y = 3\sin\left(\frac{1}{2}x\right) + 1$

3. How many more ways can 10 juniors running for the positions of president, vice president, secretary, and treasurer be selected when compared to 12 sophomores running for 5 identical positions of class representative?

 A. 94,830 **B.** 11,628 **C.** 4,320 **D.** 4,248

4. A lamppost is located 418 feet from a building. The angle of elevation from the base of the lamppost to the top of the building is $32.3°$. *Approximately* how tall is the building?

 A. 223 feet **B.** 264 feet **C.** 510 feet **D.** 661 feet

5. The table below shows the midterm and final exam grades of ten students.

Midterm	68	78	92	90	88	82	94	83	71	62
Final Exam	62	77	99	87	85	84	95	98	72	64

Which comparison between the midterm grades and the final exam grades is true?

A. The final exam grades have a higher mean and standard deviation than the midterm grades.

B. The final exam grades have a lower mean and standard deviation than the midterm grades.

C. The final exam grades have a higher mean and a lower standard deviation than the midterm grades.

D. The final exam grades have a lower mean and a higher standard deviation than the midterm grades.

6. A Ferris wheel has a diameter of 80 feet. Riders enter the Ferris wheel at its lowest point, 5 feet above the ground, at time $t = 0$ seconds. One complete rotation takes 65 seconds.
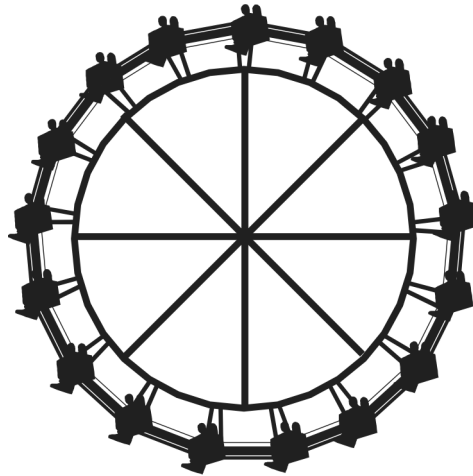
Which function models a rider's vertical height, $h(t)$, at t seconds?

A. $h(t) = -80 \cos\left(\dfrac{2\pi}{65}t\right) + 5$

B. $h(t) = -40 \cos\left(\dfrac{2\pi}{65}t\right) + 45$

C. $h(t) = -45 \cos\left(\dfrac{65}{2\pi}t\right) + 40$

D. $h(t) = -5 \cos\left(\dfrac{65}{2\pi}t\right) + 80$

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7. Given the following histogram, how can we describe the shape of the data?
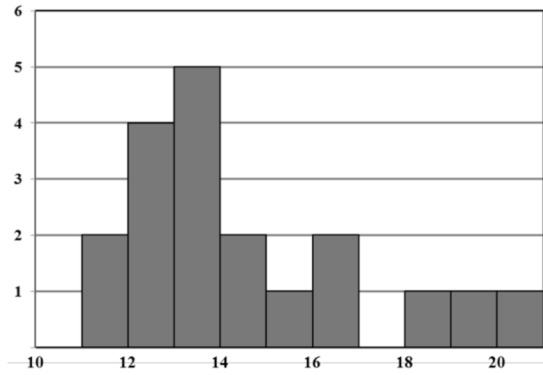
    A. Skewed right   **B.** Skewed left   **C.** Symmetric   **D.** Constant

8. What is the nth term in the arithmetic series below?

    $3 + 7 + 11 + 15 + 19 \ldots$

    A. $4n$ **B.** $3 + 4n$ **C.** $2n + 1$ **D.** $4n - 1$

9. A pharmaceutical company is creating a new cholesterol drug to prevent heart disease. The company must collect data by testing the drug before it is approved. Which would be the *best* method of data collection?

   **A.** experimental study   **B.** observational study   **C.** simulation   **D.** survey

10. Which function describes the sequence 3, 6, 12, 24, ... for $n = 1, 2, 3, \ldots$?

    A. $f(n) = 3n$ **B.** $f(n) = n^2 + 2$ **C.** $f(n) = 3(2^{n-1})$ **D.** $f(n) = (n - 1)^2 + 3$

11. Lucy invested $6,000 into an account that earns 6% interest compounded continuously. *Approximately* how long will it take for Lucy's investment to be valued at $25,000?

    A. 52.7 years   **B.** 46.9 years   **C.** 24.5 years   **D.** 23.8 years

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12. Which piecewise function is graphed below?
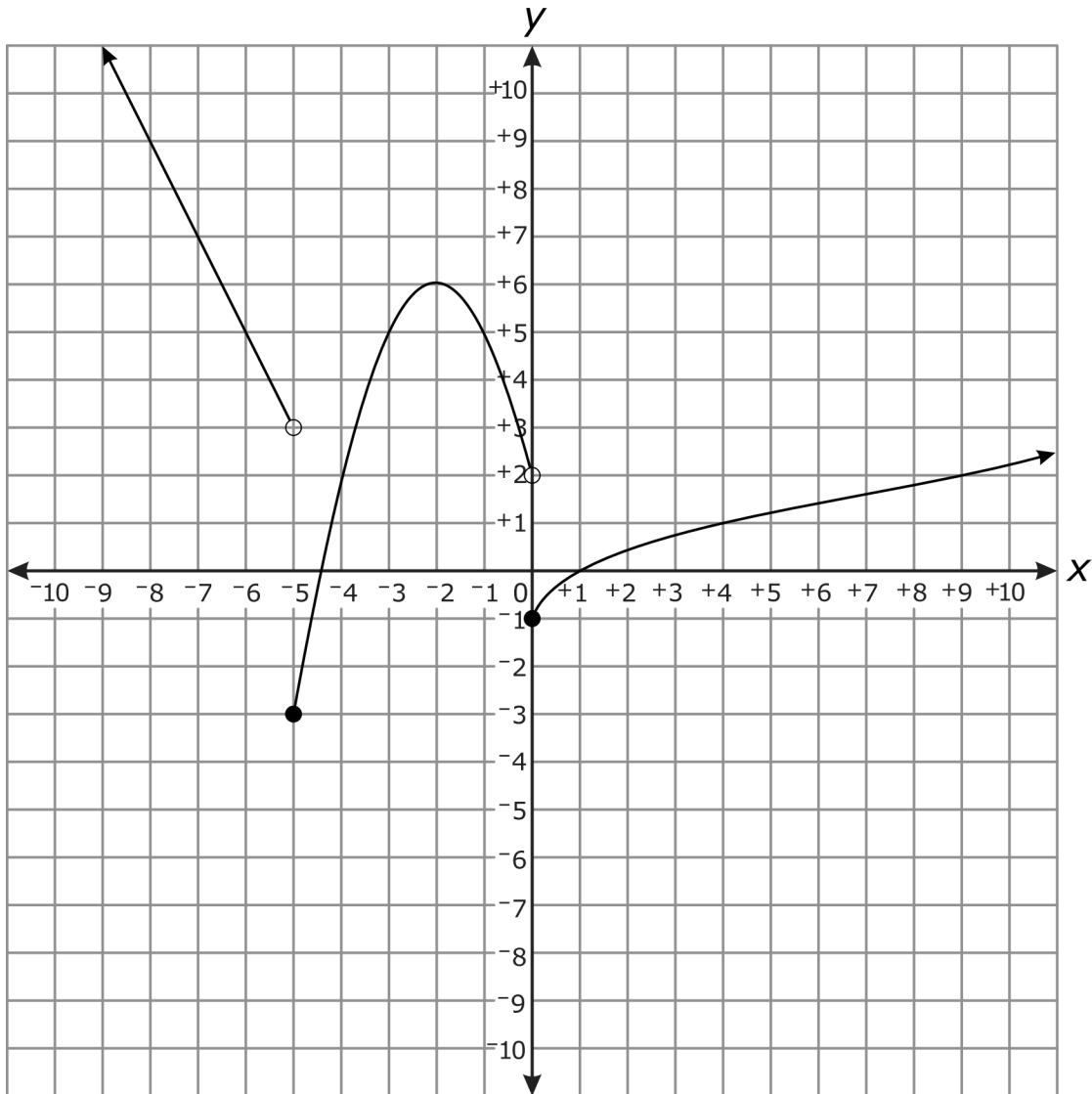
A. $f(x) = \begin{cases} -2x - 7 & \text{for x < -5} \\ -(x+2)^2 + 6 & \text{for -5 <= x < 0} \\ \sqrt{x} - 1 & \text{for x >= 0} \end{cases}$

B. $f(x) = \begin{cases} -2x - 7 & \text{for x < -5} \\ -(x-2)^2 + 6 & \text{for -5 <= x < 0} \\ \sqrt{x-1} & \text{for x >= 0} \end{cases}$

C. $f(x) = \begin{cases} -2x - 7 & \text{for x <= -5} \\ -(x-2)^2 + 6 & \text{for -5 < x <= 0} \\ \sqrt{x-1} & \text{for x > 0} \end{cases}$

D. $f(x) = \begin{cases} -2x - 7 & \text{for x <= -5} \\ -(x+2)^2 + 6 & \text{for -5 < x <= 0} \\ \sqrt{x} - 1 & \text{for x > 0} \end{cases}$

13. If the probability of giving birth to a boy is 0.52, what is the *approximate* probability of giving birth to four consecutive boys?
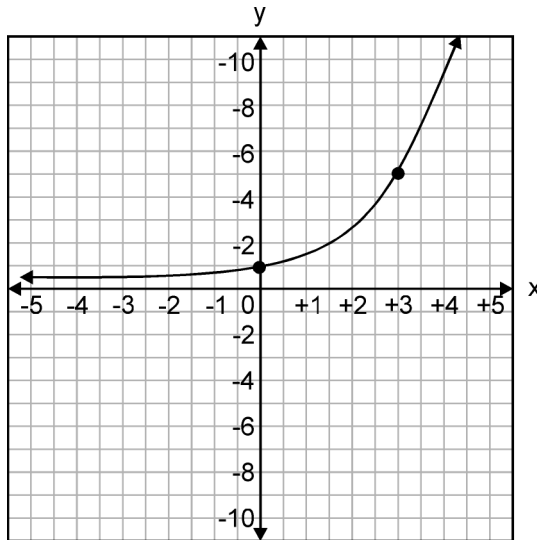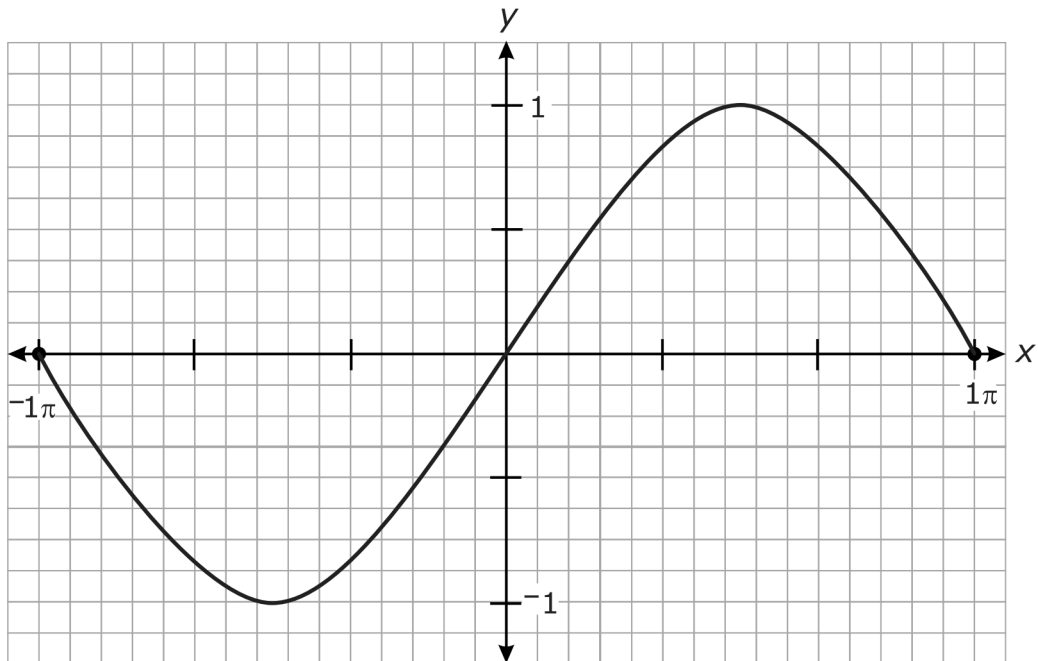
A. 0.021   **B.** 0.062   **C.** 0.073   **D.** 0.130

14. The graph of $y = a^x$ is shown below.

Which choice is closest to $\log_a 3$?

A. 0.9   **B.** 2.1   **C.** 3.2   **D.** 4.8

15. Which function is graphed below?

A. $y = \sin x$ **B.** $y = \cos x$ **C.** $y = \tan x$ **D.** $y = \cot x$

16. What value of x satisfies the equation $\log_3(x - 4) = 2$?

A. 5   **B.** 10   **C.** 12   **D.** 13

17. A starting line for a hockey team should consist of 3 offensive players, 2 defensive players, and 1 goaltender. A coach has 11 offensive players, 6 defensive players, and 2 goaltenders from which to choose the starting line. How many unique starting lines can the coach create?

    A. 132 B. 792 C. 4,950 D. 59,400

18. The probability that it will rain on Saturday is $\frac{2}{3}$. The probability that the temperature on Saturday will reach $100°$F is $\frac{4}{9}$. The probability that it will rain or reach $100°$F on Saturday is $\frac{4}{5}$. What is the probability it will rain and reach $100°$F on Saturday?

    A. $\frac{14}{45}$ B. $\frac{16}{45}$ C. $\frac{24}{45}$ D. $\frac{26}{45}$

19. A spinner labeled 1 to 9 gives each of the numbers 2, 5, 7, and 9 a $\frac{3}{20}$ chance of being landed upon. The chance of landing on each of the other five numbers is equal. If the spinner is spun 1,000 times, which choice is the *most likely* outcome for the 1,000 spins?

    A.

Number on Spinner	1	2	3	4	5	6	7	8	9
Number of Occurrences	110	112	111	111	109	112	112	111	112

    B.

Number on Spinner	1	2	3	4	5	6	7	8	9
Number of Occurrences	82	148	78	80	149	79	151	81	152

    C.

Number on Spinner	1	2	3	4	5	6	7	8	9
Number of Occurrences	120	122	100	103	108	126	113	104	104

    D.

Number on Spinner	1	2	3	4	5	6	7	8	9
Number of Occurrences	121	100	119	120	102	120	98	121	99

20. Which statement is true about the series shown below?

$$^-4 + {}^-2 + {}^-1 + \frac{^-1}{2} + \frac{^-1}{4} + \ldots$$

    A. The series converges because $|r| < 1$. B. The series diverges because $|r| < 1$.

    C. The series converges because $|r| > 1$. D. The series diverges because $|r| > 1$.

21. The frequency table below shows the number of runners in specific age groups for a certain race.

Age Group	Number of Runners
0–10	‖
11–20		
21–30	ЖЖ ЖЖ ‖
31–40	ЖЖ	
41–50	ЖЖ
51–60		
61–70	‖
71–80		
81–90	‖

What is the shape of the distribution?

A. uniform   **B.** skewed right   **C.** skewed left   **D.** normal

22. What is the sum of the infinite geometric series

$$\tfrac{1}{2} + \tfrac{1}{4} + \tfrac{1}{8} + \tfrac{1}{16} + \ldots?$$

A. 1   **B.** 1.5   **C.** 2   **D.** 2.5

23. An object is launched straight upward from ground level with an initial velocity of 50.0 feet per second. The height, h (in feet above ground level), of the object t seconds after the launch is given by the function $h(t) = {}^{-}16t^2 + 50t$.

At *approximately* what value of t will the object have a height of 28.0 feet and be traveling downward?

A. 2.39 seconds   **B.** 1.84 seconds   **C.** 1.56 seconds   **D.** 0.73 seconds

24. The third term of a geometric sequence is 96, and the fifth term is 1,536. What is the sum of the first ten terms of this sequence?

A. 4,092   **B.** 1,572,864   **C.** 2,097,150   **D.** 33,554,400

25. A Ferris wheel is designed in such a way that the height (h), in feet, of the seat above the ground at any time, t, is modeled by the function $h(t) = 60 - 55\sin(\frac{\pi}{10}t + \frac{\pi}{2})$.
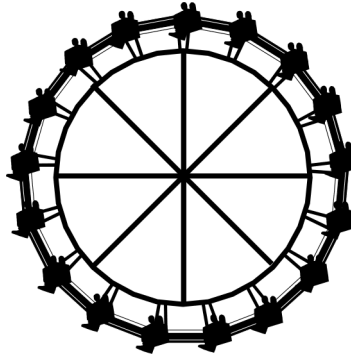
What is the *maximum* height a seat reaches?

A. 55 feet **B.** 60 feet **C.** 110 feet **D.** 115 feet

26. The number of household members, x, living in Cityville homes has the following probability distribution:

x	1	2	3	4	5	6	7	8
$P(x)$	0.21	0.28	0.16	0.22	0.06	0.04	0.02	0.01

What is the expected size of a household in Cityville?

A. 2.43 **B.** 2.89 **C.** 3.17 **D.** 4.50

27. Two sides of a triangle measure 10 inches and 13 inches. The included angle between these sides is $55°$. What is the *approximate* measure of the third side of the triangle?

A. 10.9 inches **B.** 11.2 inches **C.** 13.9 inches **D.** 16.2 inches

28. Suppose the function $H(t) = 8.5\sin(0.017t - 1.35) + 12$ models the hours of sunlight for a town in Alaska, where $t = 1$ is the first day of the year. Based on the function, what is the *approximate* range of daylight hours for the town?

A. 3.5 to 20.5 **B.** 4 to 20 **C.** 4.5 to 19.5 **D.** 5 to 19

29. A series is shown below.

$$1 + \tfrac{2}{5} + \tfrac{4}{25} + \tfrac{8}{125} + \ldots$$

Which statement is true about the sum of the series?

A. The series converges to $\frac{7}{3}$. **B.** The series converges to $\frac{5}{2}$.

C. The series converges to $\frac{5}{3}$. **D.** The series diverges.

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30. An investor bought 1,500 shares of a stock for $6 a share. He estimates the probability that the stock will rise to a value of $25 a share is 24%, and the probability it will fall to $2 a share is 76%. What is the expected value of the investor's profit from buying the stock?

A. $13,560 B. $9,120 C. $6,720 D. $2,280

31. The first five terms of a geometric sequence are shown below.

$$-\frac{25}{2}, \frac{125}{4}, -\frac{625}{8}, \frac{3125}{16}, -\frac{15625}{32}, \ldots$$

What is the common ratio of the sequence?

A. $\frac{5}{2}$ B. $\frac{2}{5}$ C. $-\frac{2}{5}$ D. $-\frac{5}{2}$

32. Which function has an amplitude that is twice the size and a period that is three times the size of the function $y = 3\cos(\frac{x}{4} - 1) + 2$?

A. $y = 6\sin(\frac{x}{12} - 3) + 1$

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

C. $y = 6\cos(\frac{3x}{4} - 1) + 3$

D. $y = \frac{3}{2}\sin(\frac{x}{12} + 3) - 1$

33. The lifetime of a particular type of car tire is normally distributed. The mean lifetime is 50,000 miles, with a standard deviation of 5,000 miles. Of a random sample of 15,000 tires, how many of the tires are expected to last for between 45,000 and 55,000 miles?

A. 7,125 B. 10,200 C. 14,250 D. 14,850

34. A sequence is shown below.

1, 0.1, 0.01, 0.001, 0.0001, ...

What is the sum of the sequence?

A. $1\frac{1}{10}$ B. $1\frac{1}{9}$ C. $1\frac{2}{9}$ D. $1\frac{9}{10}$

35. A water tower is located 410 feet from a building. From a window in the building, it is observed that the angle of elevation to the top of the tower is 42 degrees and the angle of depression to the bottom of the tower is 25 degrees. *Approximately* how tall is the water tower?

A. 191 feet B. 369 feet C. 448 feet D. 560 feet

36. A group of 12 people need to form a line. The line will consist of exactly 9 of the people. Person X and Person Y have to be either third or fourth in line. How many different orders are possible?

A. 79,833,600 B. 1,209,600 C. 604,800 D. 362,880

37. Which statement is true about the sequence shown below?

$$0, \ 4.5, \ 12, \ 22.5, \ \ldots$$

    A. The series converges because the limit of the sequence as n approaches infinity is infinity.

    B. The series converges because the limit of the sequence as n approaches infinity is 30.

    C. The series diverges because the limit of the sequence as n approaches infinity is infinity.

    D. The series diverges because the limit of the sequence as n approaches infinity is 30.

38. In a geometric sequence, $a_1 = 12$ and $r = \sqrt{2}$. What is the *approximate* sum of the first 20 terms of the sequence?

    A. 339.4   **B.** 8,688.9   **C.** 29,624.9   **D.** 29,636.9

39. A teacher counts the final exam as 25% of each student's class grade. The remaining 75% is the mean of the student's test scores from the semester. Jaleesa's test scores for the semester are 86, 90, 92, and 80. What is the *minimum* score Jaleesa must get on the final exam to have a class grade of 85.0 or higher?

    A. 77   **B.** 79   **C.** 81   **D.** 83

40. It costs a bakery $3.50 to make apple pies that sell for $12 the first day they are baked.

    - If a pie is not sold on the first day, the new price is $8.50.
    - The probability of selling the apple pie the first day is 75%.
    - There is a 12% probability of selling it on the second day.
    - If the apple pie does not sell by the end of the second day, it is donated.

What is the *approximate* expected profit per pie for the bakery on the sale of its apple pies?

    A. $5.67   **B.** $6.52   **C.** $9.57   **D.** $10.02

41. A manufacturing plant produces a special kind of lightbulb.

    - Each lightbulb produced has a 0.040 probability of being defective.
    - Five lightbulbs are chosen at random from the production line.

To the nearest thousandth, what is the probability that exactly two of the five bulbs will be defective?

    A. 0.014   **B.** 0.016   **C.** 0.018   **D.** 0.020

42. A piecewise function is shown below.

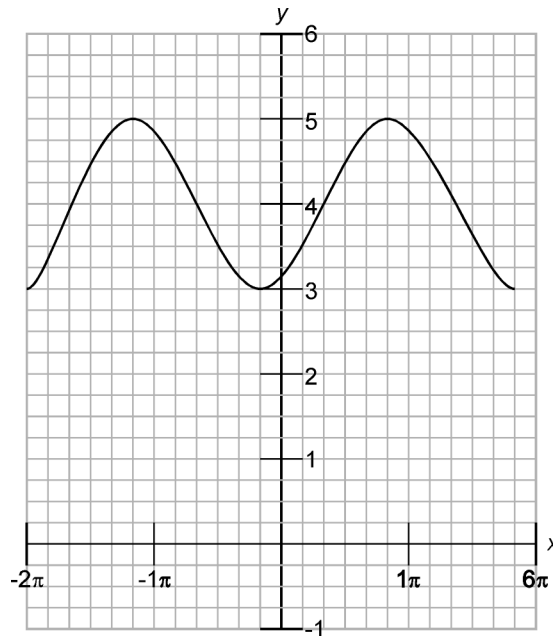$$h(x) = \begin{cases} -2x^2 + 5x + 10 & \text{for } -4 \le x < 3 \\ 2x + 3p & \text{for } 3 \le x \le 5 \end{cases}$$

For what value of p will the function be continuous?

A. $\dfrac{10}{3}$ B. $\dfrac{1}{3}$ C. $\dfrac{-25}{3}$ D. $\dfrac{-34}{3}$

43. Which function results by shifting the graph of $y = \ln(x + 3) - 6$ to the left 4 units and down 3 units?

A. $y = \ln(x + 7) - 9$ B. $y = \ln(x - 1) - 9$ C. $y = \ln(x + 7) - 3$ D. $y = \ln(x - 1) - 3$

44. Which function correctly represents the graph below?

A. $y = \sin\left(x - \dfrac{\pi}{3}\right) + 4$ B. $y = \sin\left(x + \dfrac{\pi}{3}\right) + 4$ C. $y = \cos\left(x - \dfrac{\pi}{3}\right) + 4$ D. $y = \cos\left(x + \dfrac{\pi}{3}\right) + 4$

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1.		
Answer:	D	
Points:	1	

2.		
Answer:	B	
Points:	1	

3.
Answer: D
Points: 1

4.
Answer: B
Points: 1

5.
Answer: A
Points: 1

6.
Answer: B
Points: 1

7.
Answer: A
Points: 1

8.
Answer: D
Points: 1

9.
Answer: A
Points: 1

10.
Answer: C
Points: 1

11.
Answer: D
Points: 1

12.
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Answer: C
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Answer: B
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Answer: A
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Answer: D
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Answer: C
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Answer: A
Points: 1