

Pre-Calculus 12 Practice Exam A

Multiple-Choice: Part 1 Calculator Not Permitted

1. Consider the graph of $y = -3 \cos \frac{\pi(x-2)}{10} + 4$. Which statement is false?

| | |
|------|-----------------------------------|
| I. | The amplitude is 3 |
| II. | The period is 10 |
| III. | The phase shift is 2 to the right |
| IV. | The vertical displacement is 4 up |

- A. I
B. II
C. III
D. IV

2. Solve: $\cos x = \frac{\sqrt{3}}{2}$, $0 \leq x < 2\pi$

- A. $\frac{\pi}{6}, \frac{5\pi}{6}$
B. $\frac{\pi}{6}, \frac{11\pi}{6}$
C. $\frac{\pi}{3}, \frac{2\pi}{3}$
D. $\frac{\pi}{3}, \frac{5\pi}{3}$

3. Determine an expression for all angles coterminal with a standard position angle measuring 120° . Express your answer in radians.

A. $\frac{5\pi}{6} + \pi n$, n is an integer

B. $\frac{2\pi}{3} + \pi n$, n is an integer

C. $\frac{5\pi}{6} + 2\pi n$, n is an integer

D. $\frac{2\pi}{3} + 2\pi n$, n is an integer

4. Determine the exact value of $\tan 75^\circ$.

A. $2 + \sqrt{3}$

B. $-2 - \sqrt{3}$

C. $\frac{5 + \sqrt{3}}{4}$

D. $\frac{3 + \sqrt{3}}{\sqrt{3}}$

5. A point with an x value of 2 lies on the circle with equation $x^2 + y^2 = 5$. This point also lies on the terminal arm of θ in standard position. Determine the value of $\sec \theta$.

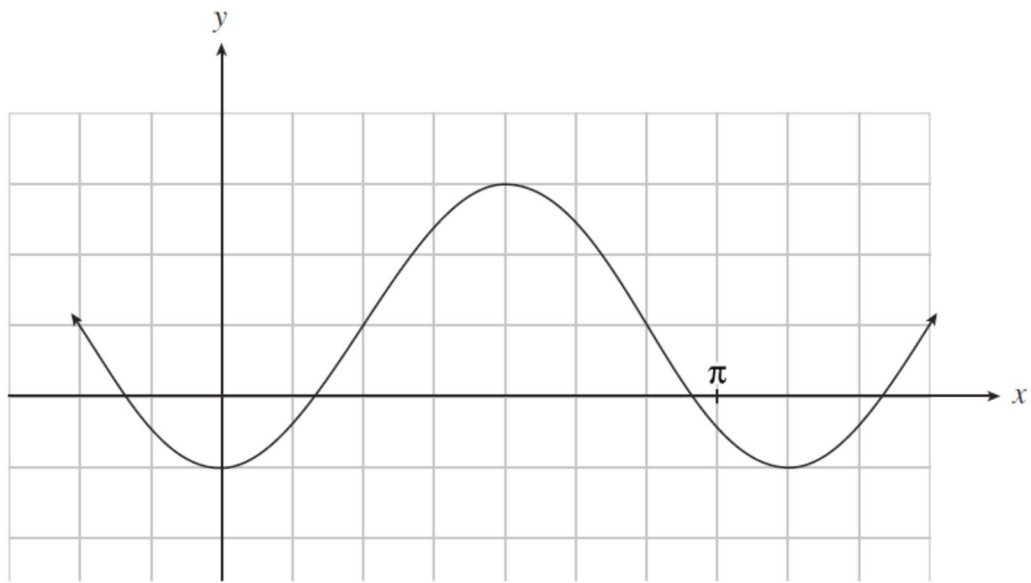
A. $\frac{\sqrt{5}}{2}$

B. $\frac{5}{2}$

C. $\frac{2}{\sqrt{5}}$

D. $\frac{2}{5}$

6. The graph of $y = 2 \sin b(x - c) + 1$ is shown below. Determine a value of c .



- A. $-\frac{2\pi}{2}$
- B. 2
- C. $\frac{\pi}{4}$
- D. $\frac{2\pi}{7}$
7. Determine all restrictions for the expression $\frac{\tan x}{\cos x - 1}$.

- A. $\cos x \neq 0$
- B. $\cos x \neq 1$
- C. $\sin x \neq 0, \cos x \neq 1$
- D. $\cos x \neq 0, \cos x \neq 1$

8. Solve: $\sin x = -\cos x$, $-\pi \leq x \leq \pi$

A. $-\frac{\pi}{4}, \frac{3\pi}{4}$

B. $\frac{\pi}{4}, \frac{3\pi}{4}$

C. $\frac{3\pi}{4}, \frac{7\pi}{4}$

D. $\frac{3\pi}{4}, \frac{5\pi}{4}$

9. Simplify: $\frac{\csc \theta - \sin \theta}{\sec \theta - \cos \theta}$

A. $\cot^2 \theta$

B. $\cot^3 \theta$

C. $\tan^2 \theta$

D. $\tan^3 \theta$

10. Solve: $2^{3x-1} = 8^{2x+1}$

A. $x = -\frac{4}{3}$

B. $x = -1$

C. $x = -\frac{2}{3}$

D. $x = -\frac{3}{4}$

11. Express $\log \frac{x^2}{10y^3}$ in terms of $\log x$ and $\log y$.

- A. $2\log x - 1 - 3\log y$
- B. $2\log x - 1 + 3\log y$
- C. $2\log x - 10 - 3\log y$
- D. $2\log x - 10 + 3\log y$

12. Evaluate: $\log_3 \sqrt{27}$

- A. $\frac{2}{9}$
- B. $\frac{2}{3}$
- C. $\frac{3}{2}$
- D. $\frac{9}{2}$

13. Bart and Arnie presented separate solutions to the statement:

“Write $\log_2 x + \log_4 y$ as a single log.”

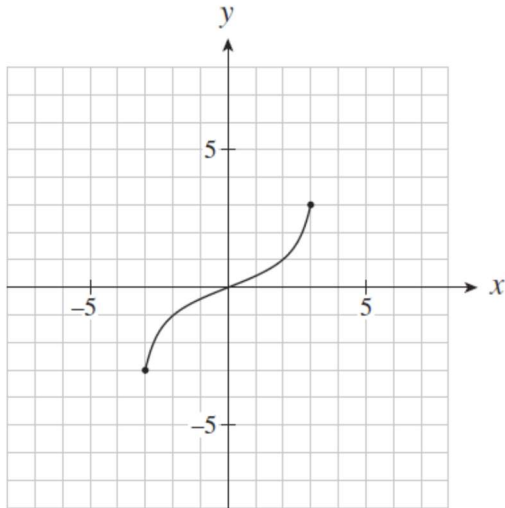
| Bart | Arnie |
|--|--|
| $\log_2 x + \log_4 y$ | $\log_2 x + \log_4 y$ |
| $= \frac{\log_4 x}{\log_4 2} + \log_4 y$ | $= \log_2 x + \frac{\log_2 y}{\log_2 4}$ |
| $= 2 \log_4 x + \log_4 y$ | $= \log_2 x + \frac{1}{2} \log_2 y$ |
| $= \log_4 x^2 y$ | $= \log_2 x \sqrt{y}$ |

Which statement is true?

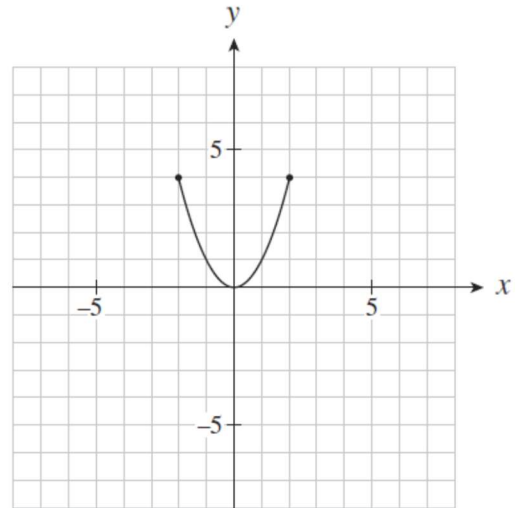
- A. Only Bart is correct.
 - B. Only Arnie is correct.
 - C. They are both wrong.
 - D. They are both correct.
14. Which statement must be true for $f(x) = \log_{\frac{1}{2}} x$ when $x_2 > x_1$?
- A. $f(x_1) > f(x_2)$
 - B. $f(x_2) > f(x_1)$
 - C. $f(x_1) > 0$, $f(x_2) < 0$
 - D. $f(x_2) > 0$, $f(x_1) < 0$

15. For which graph is the relation and its inverse both functions?

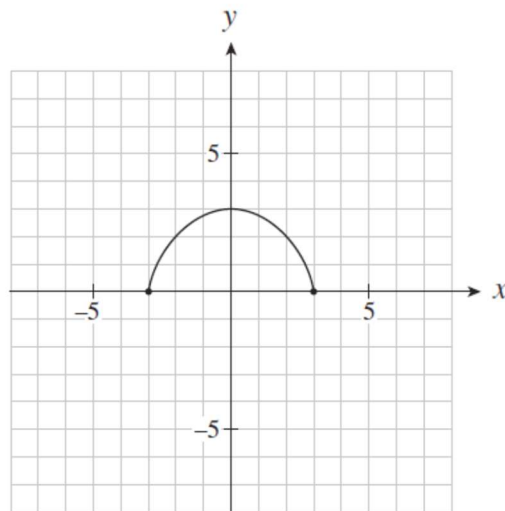
A.



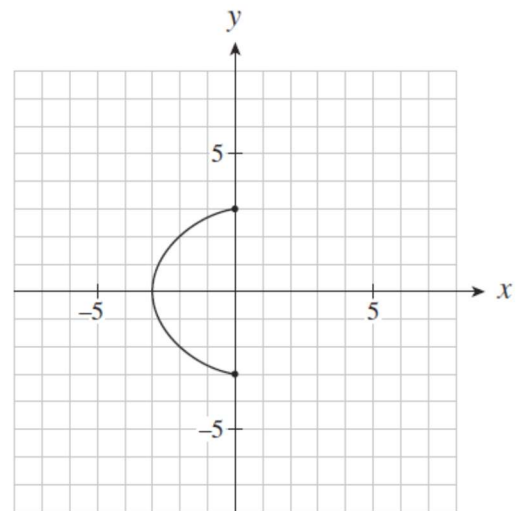
B.



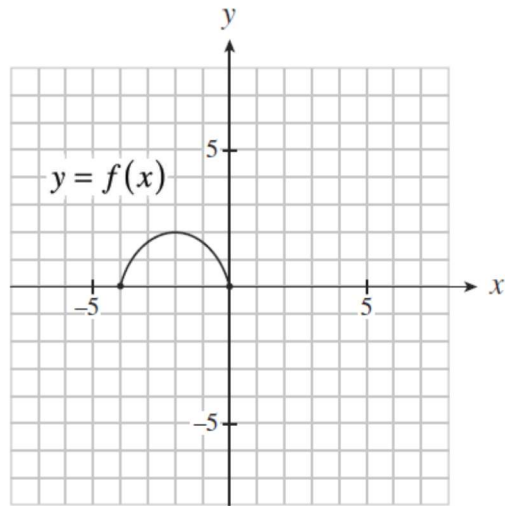
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D.

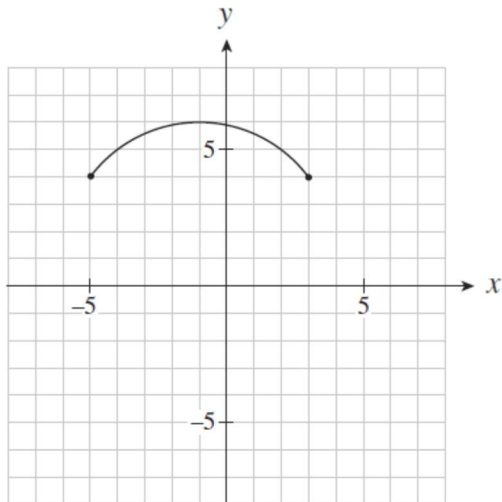


16. The graph of $y = f(x)$ is shown below.

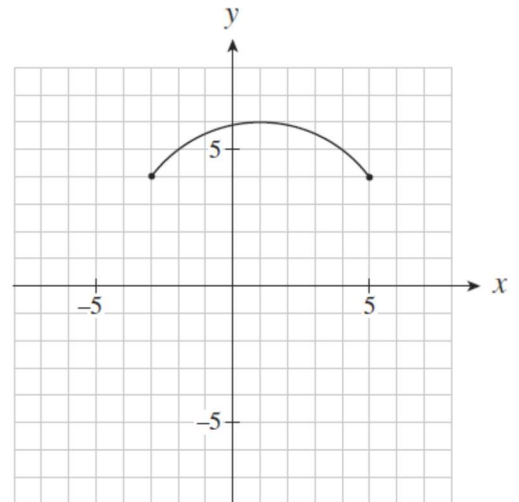


Which graph represents the graph of $y = f(2(x - 3)) + 4$?

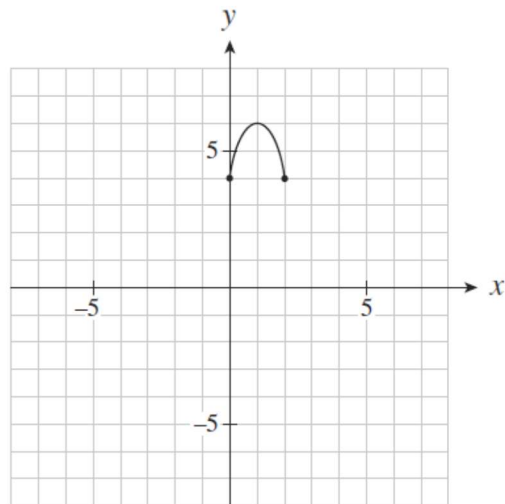
A.



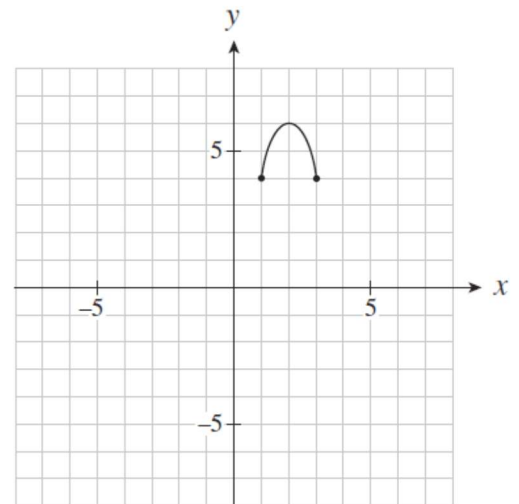
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C.



D.

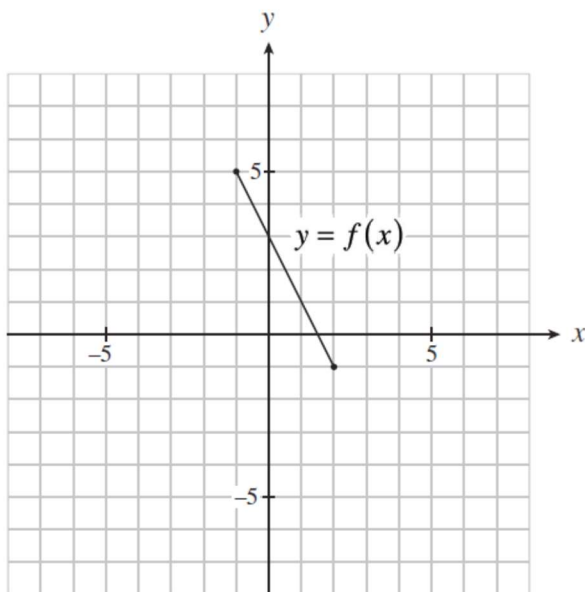


17. Consider the following transformations on the graph of $y = f(x)$.

| | |
|------|----------------|
| I. | $y = f(x + 2)$ |
| II. | $y = 2f(x)$ |
| III. | $y = f(-x)$ |
| IV. | $y = -f(x)$ |

Which transformations will have no effect on the zeros of the original graph of $y = f(x)$?

- A. I and II only
B. II and III only
C. II and IV only
D. III and IV only
18. The graph of $y = f(x)$ as shown below is transformed to $x = f(y)$. Determine all invariant points.



- A. $(0, 3)$
B. $(1, 1)$
C. $(2, -1)$
D. $(1, 1)$ and $(2, -1)$

19. The point P(4, 6) lies on the graph of $y = f(x)$. Which point must lie on the graph of $y = -\frac{1}{2}f\left(\frac{1}{2}x + 2\right)$?

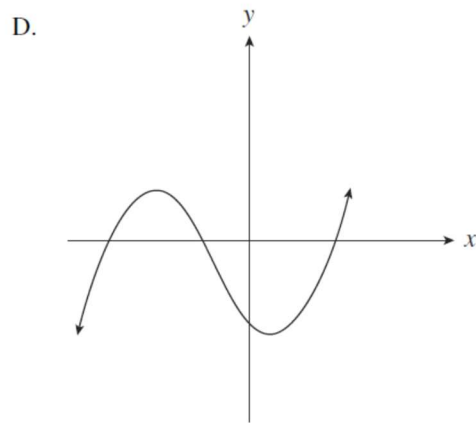
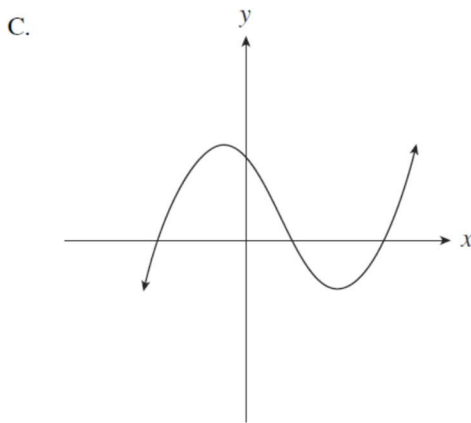
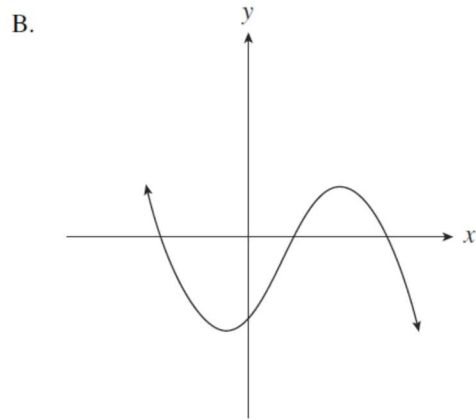
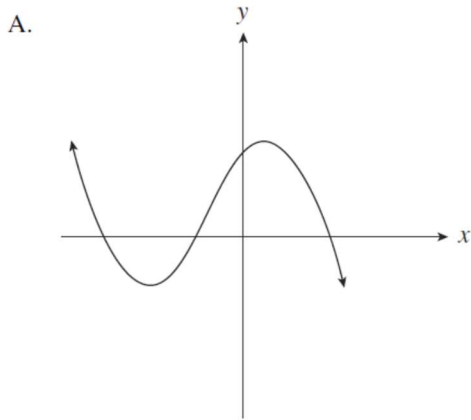
- A. (7, -3)
- B. (4, -3)
- C. (1, -3)
- D. (-2, -3)

20. Which of the following functions are polynomial functions?

| | |
|------|------------------------------------|
| I. | $y = x^3 - \sqrt{2}x^2 + x + 3$ |
| II. | $y = x^3 - \frac{2}{x^2} - x + 3$ |
| III. | $y = x^3 - 2x^{1.5} + x + 3$ |
| IV. | $y = x^3 - \frac{1}{2}x^2 - x + 3$ |

- A. III only
- B. IV only
- C. I and IV only
- D. II and III only

21. Which sketch best represents the graph of $y = ax^3 - bx^2 + cx + 24$ if $a < 0$?



22. Which three expressions are factors of $9x^3 - 36x^2 - 4x + 16$?

| | |
|------|----------|
| I. | $x - 4$ |
| II. | $x + 4$ |
| III. | $3x - 2$ |
| IV. | $3x + 2$ |

- A. I, II, III only
 B. I, II, IV only
 C. I, III, IV only
 D. II, III, IV only

23. When $x^3 - 2kx^2 + 3k^2x - 15$ is divided by $x - 2$, the remainder is 1. Determine all values for k .

A. $k = -4$

B. $k = \frac{17}{8}$

C. $k = -\frac{2}{3}, 2$

D. $k = \frac{2}{3}, -2$

24. Given $f(x) = x + 2$ and $g(x) = x^2 + 3x - 1$, determine the value of $f(g(3))$.

A. 16

B. 17

C. 19

D. 39

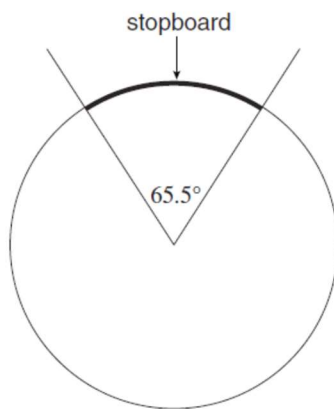
25. Consider the graphs of the functions $f(x) = x^2$ and $g(x) = \sqrt{f(x)}$. Which row describes the domains and range of $g(x)$?

| | Domain | Range |
|----|------------------|------------------|
| A. | all reals | all reals |
| B. | has restrictions | has restrictions |
| C. | has restrictions | all reals |
| D. | all reals | has restrictions |

26. Determine the range of the function $y = \sqrt{3x - 9} + 2$.
- A. $y \geq 0$
 - B. $y \geq 2$
 - C. $y \geq 3$
 - D. $y \geq 9$

Multiple-Choice: Part 2 Calculator Permitted

27. Determine the smallest zero for $y = 4 \sin 3\theta + 2$ in the interval $2\pi \leq \theta \leq 3\pi$.
- A. 0.38
 - B. 1.22
 - C. 6.66
 - D. 7.50
28. In high school, a shot put is thrown out of a circle with a radius of 3.5 feet. A curved wooden "stopboard" is placed in an arc around part of this circle. The central angle is 65.5° . Determine the length of the curved "stopboard."



- A. 3.5 feet
- B. 4.0 feet
- C. 4.5 feet
- D. 5.0 feet

29. On Oct. 2, 2010, the tide at New Westminster reached a maximum height of 10.8 feet at midnight. At 9 am the tide reached the next minimum height of 5.8 feet. Assuming the relationship is sinusoidal, what was the height of the tide at 7 am?
- A. 6.1 feet
 - B. 6.4 feet
 - C. 8.7 feet
 - D. 9.9 feet
30. Solve: $7 = 2^{x+1}$
- A. -0.64
 - B. 1.36
 - C. 1.81
 - D. 3.81
31. The population in a particular community is increasing at an annual rate of 6.5%. Assume this trend will continue. In how many years will the present population of 12 000 grow to 32 000?
- A. 15.5
 - B. 15.6
 - C. 15.8
 - D. 16.1

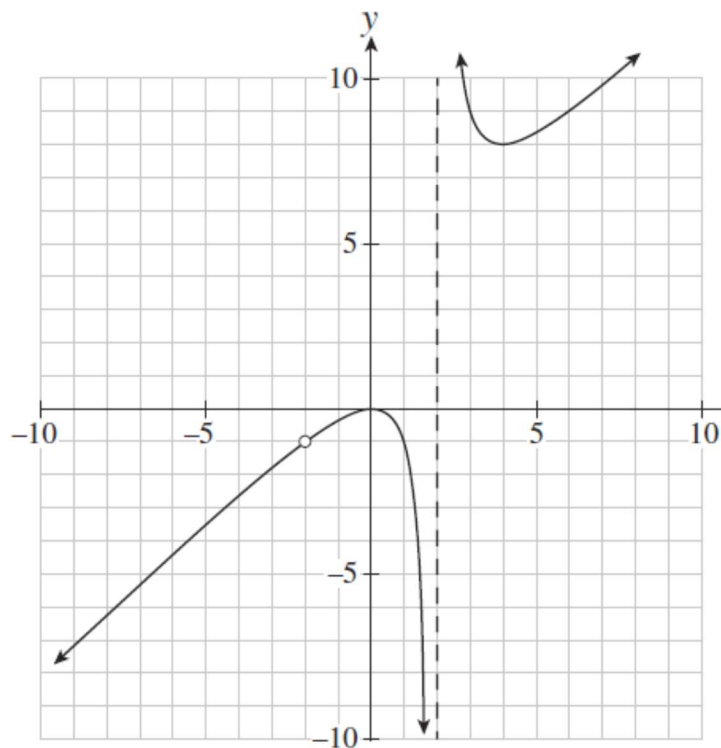
32. In a study which compared the pH of urine and tears, the following data was collected.

| | Urine | Tears |
|----------------|------------|------------|
| Joe | 6.2 | 7.6 |
| Bob | 6.3 | 7.4 |
| Bill | 5.5 | 7.5 |
| Average | 6.0 | 7.5 |

On average, how many times more alkaline are tears than urine?

- A. 1.3
B. 1.5
C. 15.0
D. 31.6
33. When a polynomial $P(x)$ is divided by $x + 3$, the remainder is 2. Which point must be on the graph of the corresponding function $y = P(x)$.
- A. $(-3, -2)$
B. $(-3, 0)$
C. $(-3, 2)$
D. $(3, 2)$

34. Determine the range of the rational function graphed below.



- A $\{y: y \in \mathbb{R}\}$
 B $\{y: y \leq 0, y \geq 8 \mid y \in \mathbb{R}\}$
 C $\{y: y \neq 2 \mid y \in \mathbb{R}\}$
 D $\{y: y \leq 0, y \neq -1, y \geq 8 \mid y \in \mathbb{R}\}$
35. The graph of $y = f(x)$ is stretched horizontally by a factor of $\frac{1}{4}$. Determine the equation of the transformed graph.

- A. $y = \frac{1}{4}f(x)$
 B. $y = 4f(x)$
 C. $y = f\left(\frac{1}{4}x\right)$
 D. $y = f(4x)$

36. How many terms are there in the series defined by $\sum_{k=4}^{31} 2(3)^{k-1}$

- A. 27
- B. 28
- C. 30
- D. 31

37. Determine the sum of the first 10 terms of the geometric series defined by $\frac{2}{3} - 2 + 6 - 18 + \dots$

- A. -9 841.33
- B. 3 280.67
- C. 9 841.67
- D. 19 682.67

38. In a geometric sequence, $t_2 = 480$ and $t_7 = -15$. Determine the common ratio, r .

- A. -3
- B. -2
- C. $-\frac{1}{3}$
- D. $-\frac{1}{2}$

39. The sum of the infinite geometric series $t + t^2 + t^3 + t^4 + \dots$ is $4t$, $t \neq 0$. The value of t is

- A. $\frac{4}{3}$
- B. $\frac{3}{4}$
- C. $\frac{1}{2}$
- D. $\frac{1}{4}$

40. Solve $\ln(-x) + \ln 6 = 2$

- A. -10.8
- B. -1.2315
- C. 17.2411
- D. 55

41. Identify the domain of the function $y = \ln(4x + 16) - 2$

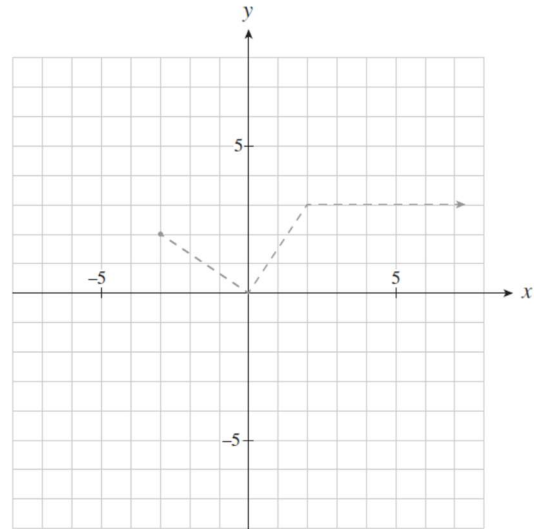
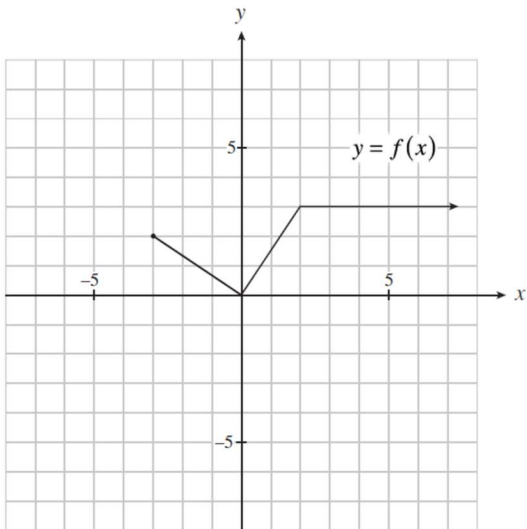
- A. $x > -4$
- B. $x < -2$
- C. $x > 4$
- D. $x < 4$

42. Solve $e^{7x} + 2 = 38.8$

- A. 0.1922
- B. 0.2237
- C. 0.5151
- D. 0.2107

Written Response

1. The graph of $y = f(x)$ is shown. On the grid provided, sketch the graph of $y = 2f(-x) - 3$.



2. Solve algebraically: $\log_{15}(3 - x) + \log_{15}(1 - x) = 1$

3. Solve algebraically $0 \leq \theta < 2\pi$. Give exact values if possible, otherwise round answers to two decimal places.

$$3\sin^2\theta + 5\cos\theta = 1$$

4. Find the intercepts, vertical asymptotes and points of discontinuity for the following functions:

a) $f(x) = \frac{x^2 - x - 6}{x^2 - 9}$

b) $g(x) = \frac{x}{x^2 - 9}$

5. Prove the identity

$$\frac{\tan 2\theta(1 - \tan\theta)\cos^2\theta}{\sin 2\theta} = \frac{1}{1 + \tan\theta}$$

Answers

Multiple Choice:

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

Written:

- Some points on the new graph are (3,1) (0,-3) (-2,3) (-2,-5)
- $x = -2$
- $\theta = 1.91$ $\theta = 4.37$
-

| | $f(x)$ | $g(x)$ |
|------------------------|-------------------------------|------------------|
| Vertical Asymptote | $x = -3$ | $x = 3$ $x = -3$ |
| Point of Discontinuity | $\left(3, \frac{5}{6}\right)$ | None |
| x-intercept | $(-2, 0)$ | $(0, 0)$ |
| y-intercept | $\left(0, \frac{2}{3}\right)$ | $(0, 0)$ |