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

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 $\tan 75°$.

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 $\sec\theta$.

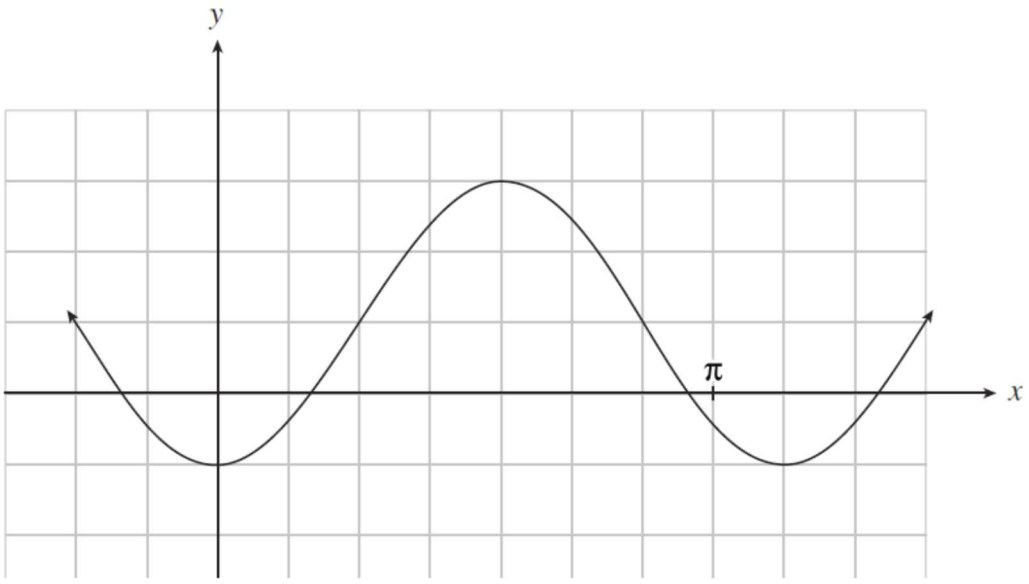
A. $\frac{\sqrt{5}}{2}$

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: $\sin x = -\cos x\,, \quad -\pi \le x \le \pi$

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
$\log_2 x + \log_4 y$	$\log_2 x + \log_4 y$
$= \dfrac{\log_4 x}{\log_4 2} + \log_4 y$	$= \log_2 x + \dfrac{\log_2 y}{\log_2 4}$
$= 2\log_4 x + \log_4 y$	$= \log_2 x + \dfrac{1}{2}\log_2 y$
$= \log_4 x^2 y$	$= \log_2 x\sqrt{y}$

Which statement is true?

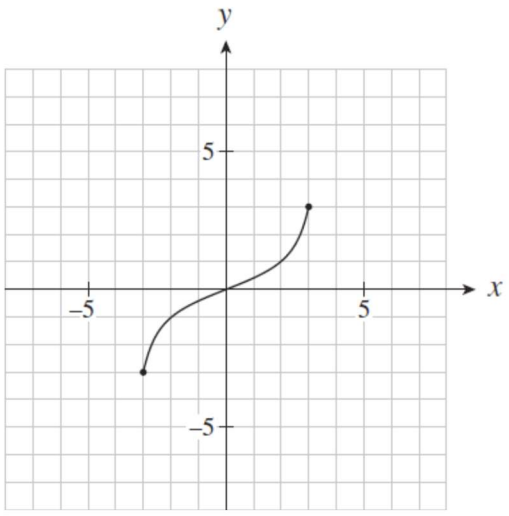
A. Only Bart is correct.
B. Only Arnie is correct.
C. They are both wrong.
D. They are both correct.

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.



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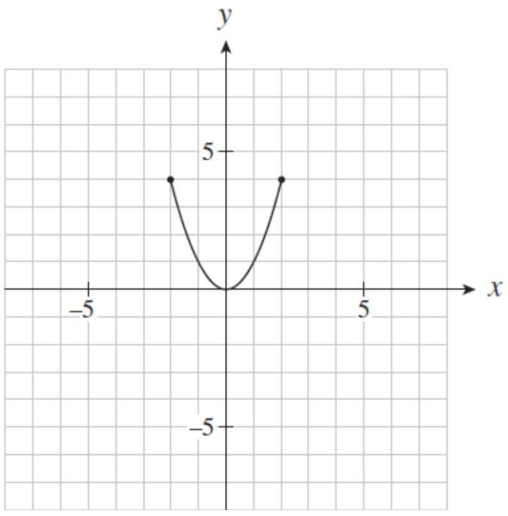

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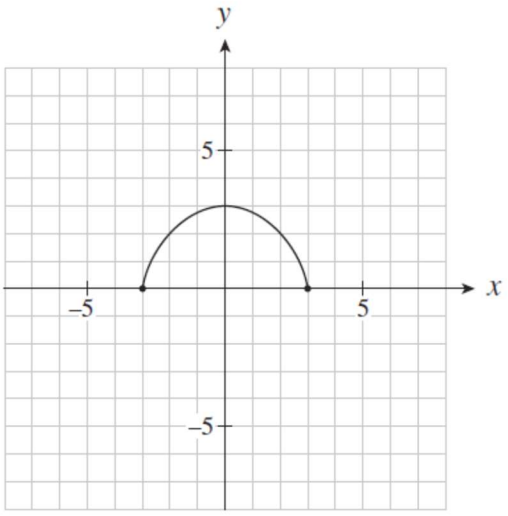

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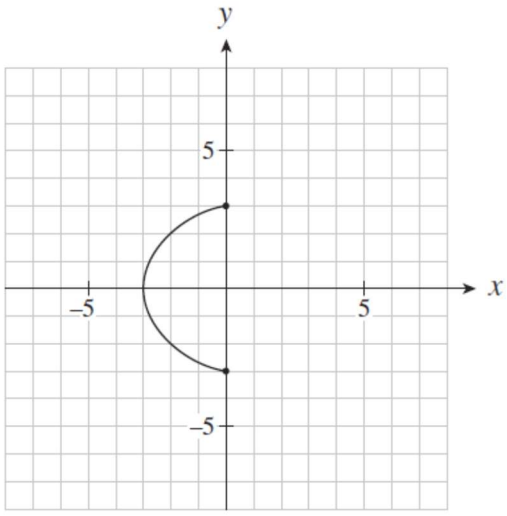
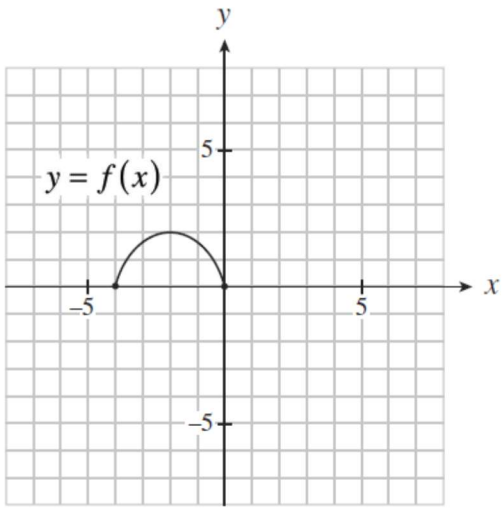
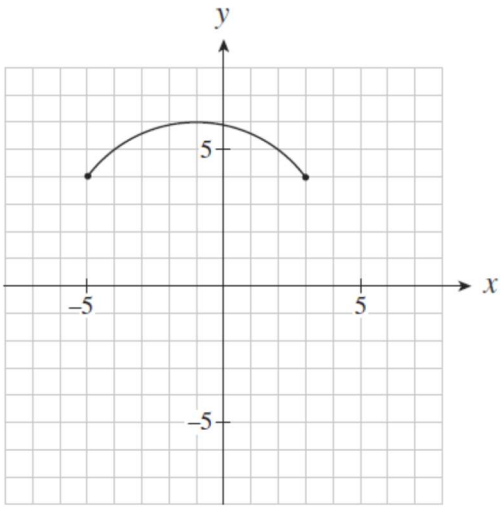


16. The graph of $y = f(x)$ is shown below.



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

A.



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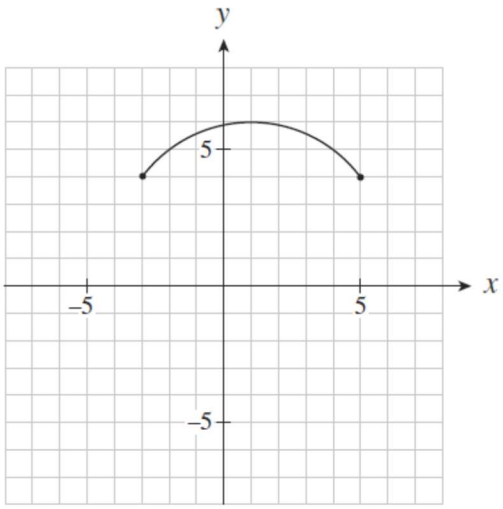

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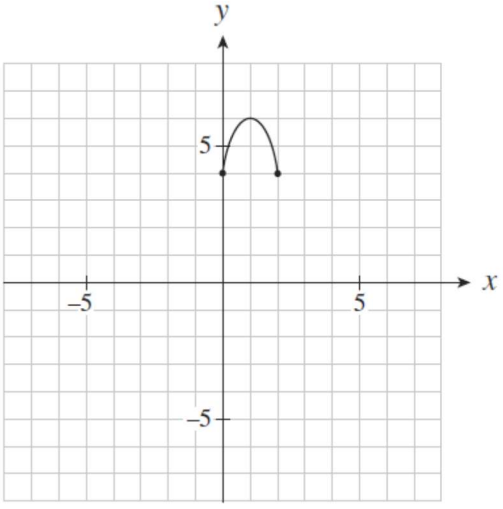
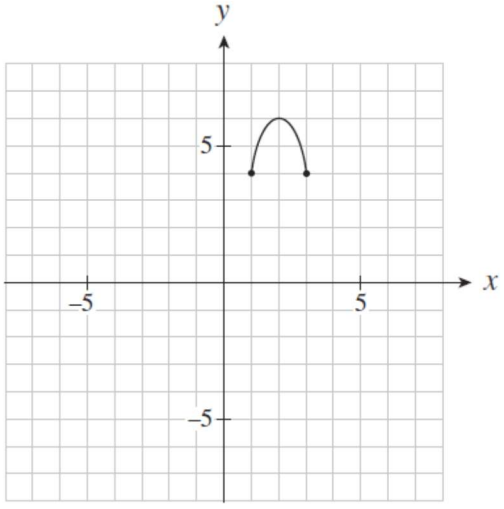


D.



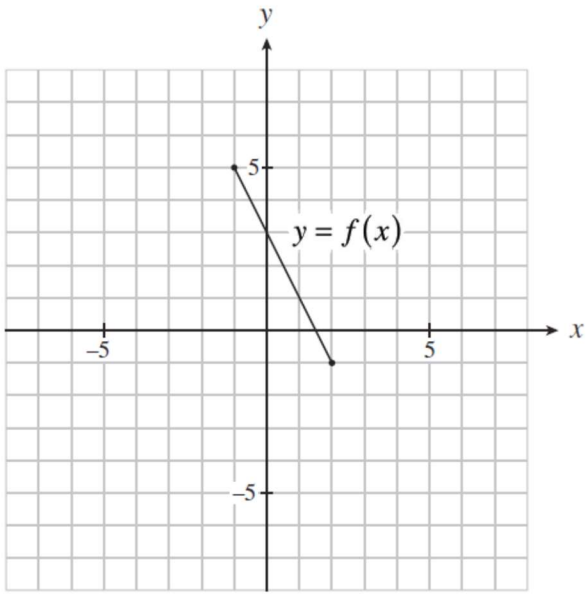
17. Consider the following transformations on the graph of $y = f(x)$.

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. $(-2,\ -3)$

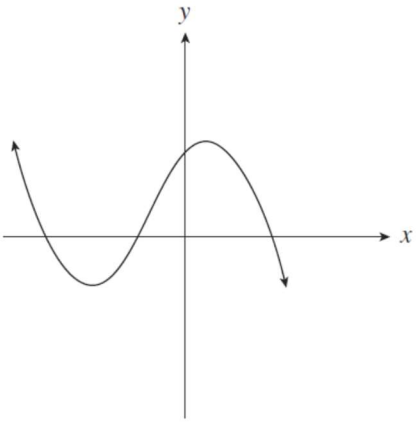
20. Which of the following functions are polynomial functions?

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.	$y = x^3 - \frac{1}{2}x^2 - x + 3$

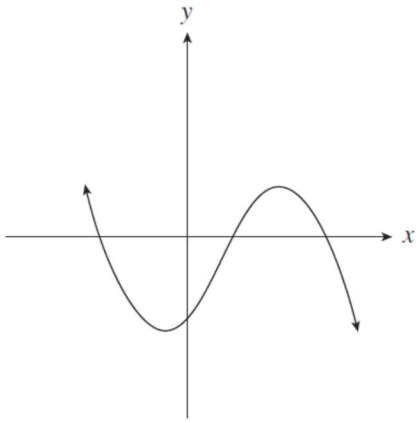
A. III only
B. IV only
C. I and IV only
D. II and III only

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

A.



B.



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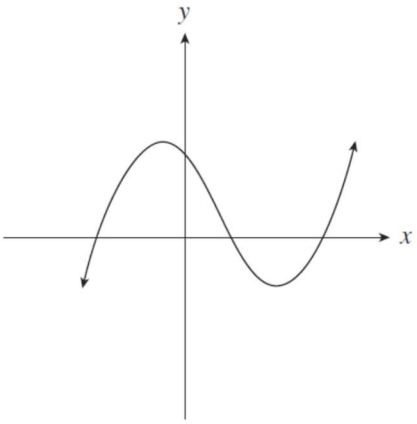
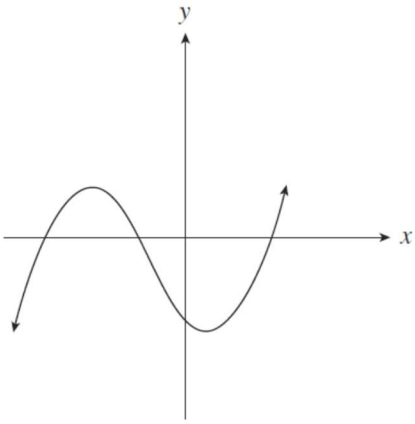


D.



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 $y = \sqrt{3x - 9} + 2$.

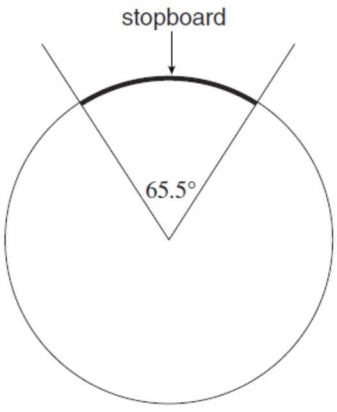
A. $y \geq 0$
B. $y \geq 2$
C. $y \geq 3$
D. $y \geq 9$

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**

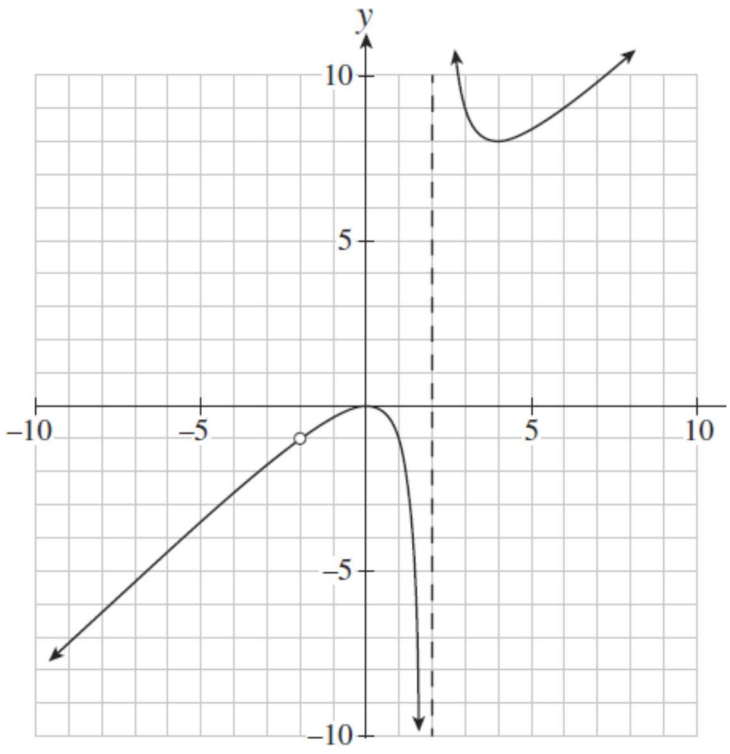
On average, how many times more alkaline are tears than urine?

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 $\{y: y \leq 0,\ y \geq 8\ y \in \mathbb{R}\}$

C $\{y: y \neq 2\ y \in \mathbb{R}\}$

D $\{y:\ y \leq 0,\ y \neq -1,\ y \geq 8\ \ y \in \mathbb{R}\}$

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 $\frac{2}{3} - 2 + 6 - 18 + \ldots$

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 $t + t^2 + t^3 + t^4 + \cdots$ 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

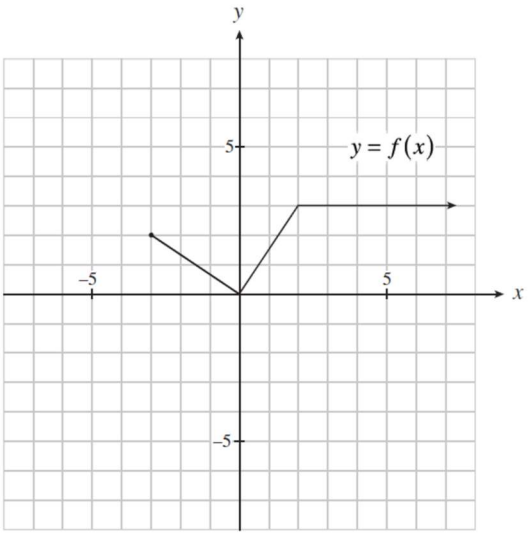
B. 0.2237

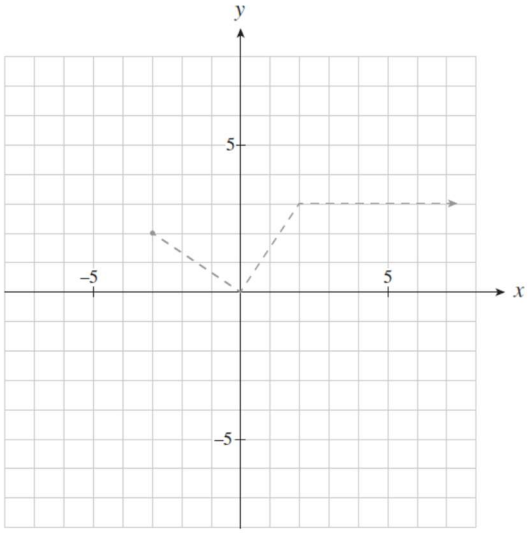
C. 0.5151

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.

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

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

$$\frac{tan2\theta(1-tan\theta)cos^2\theta}{sin2\theta} = \frac{1}{1+tan\theta}$$

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:

1. Some points on the new graph are (3,1) (0,-3) (-2,3) (-2,-5)

2. x = -2

3. $\theta = 1.91 \quad \theta = 4.37$

4.

	$f(x)$	$g(x)$
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	$\left(0, \frac{2}{3}\right)$	$(0,0)$