

**PMATH 12 - MIDTERM - PRACTICE QUESTIONS**

**Multiple Choice**

*CIRCLE the choice that best completes the statement or answers the question.*

1. Divide:  $(-4x^2 + 22x + 12) \div (x - 6)$ 

A.  $4x + 6$                       B.  $4x - 48$                       C.  $-4x + 12$                       D.  $-4x - 2$
2. What is the remainder when  $x^3 + 4 - 11x + 3x^2$  is divided by  $6 + x$ ?
 

A. 70                                  B. -62                                  C. -38                                  D. 46
3. Divide  $-3x^3 - 2x^2 + 4x + 3$  by  $x + 3$ . Write the division statement.
 

A.  $-3x^3 - 2x^2 + 4x + 3 = (x + 3)(-3x^2 - 11x + 25)$   
 B.  $-3x^3 - 2x^2 + 4x + 3 = (x + 3)(-3x^2 - 11x + 25) - 48$   
 C.  $-3x^3 - 2x^2 + 4x + 3 = (x + 3)(-3x^2 + 7x - 17)$   
 D.  $-3x^3 - 2x^2 + 4x + 3 = (x + 3)(-3x^2 + 7x - 17) + 54$
4. For the polynomial  $P(x) = -3x^2 - 4x - 5$ , what is the value of  $P(-2)$ ?
 

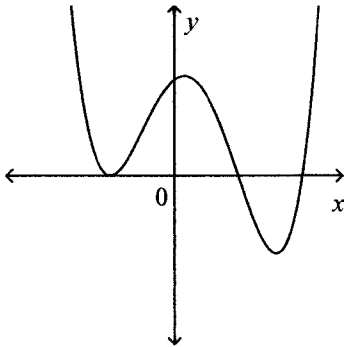
A. -25                                  B. 15                                      C. -21                                  D. -9
5. Which two binomials are factors of  $x^4 + 8x^3 + 7x^2 - 40x - 60$ ?
 

A.  $x + 2$  and  $x - 6$       B.  $x - 2$  and  $x - 6$       C.  $x - 2$  and  $x + 6$       D.  $x + 2$  and  $x + 6$
6. Use graphing technology. Graph the polynomial function  $f(x) = x^3 - 7x^2 + 11x - 5$ . Which characteristics apply to the graph?
 

<p>A. Number of <math>x</math>-intercepts: 3            Number of hills: 1            Number of valleys: 1</p>	<p>C. Number of <math>x</math>-intercepts: 2            Number of hills: 1            Number of valleys: 1</p>
<p>B. Number of <math>x</math>-intercepts: 2            Number of hills: 2            Number of valleys: 1</p>	<p>D. Number of <math>x</math>-intercepts: 1            Number of hills: 1            Number of valleys: 2</p>
7. Determine the zeros of the polynomial function  $f(x) = (x + 2)^4(x - 5)$ . State the multiplicity of each zero.
 

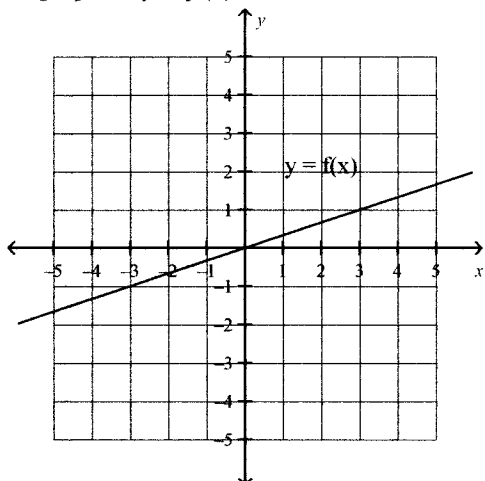
A. The zero 4 has multiplicity 2; the zero 1 has multiplicity -5.  
 B. The zero 4 has multiplicity -2; the zero 1 has multiplicity 5.  
 C. The zero -2 has multiplicity 4; the zero 5 has multiplicity 1.  
 D. The zero 2 has multiplicity 4; the zero -5 has multiplicity 1.

8. The graph of a polynomial function of degree 4 is shown. Which statements are true?
- The function has an even degree.
  - The function has a zero of multiplicity 2.
  - The equation of the function has a negative leading coefficient.
  - The  $y$ -intercept is positive.

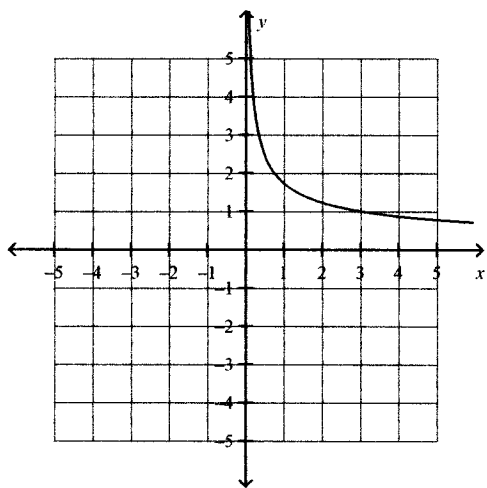


- A. i, ii, iii      B. i, iii, iv      C. ii, iii, iv      D. i, ii, iv
9. Use a graphing calculator to graph the function  $V(x) = x^3 - 7x^2 + 10x$ . Determine the coordinates of the local maximum point to the nearest tenth.
- A. (0.9, 8.2)      B. (3.8, 4.1)      C. (3.8, 8.2)      D. (0.9, 4.1)
10. Use graphing technology to solve:  $\sqrt{3x-1} = -x+5$   
Give the solution to the nearest tenth.
- A.  $x \doteq 10.5$       B.  $x \doteq 10.8$       C.  $x \doteq 2.2$       D.  $x \doteq 2.5$
11. The graph of which function below has a hole?
- A.  $y = \frac{x+2}{x^2+2}$       C.  $y = \frac{x^2}{x-4}$   
 B.  $y = \frac{x^2-9}{x+3}$       D.  $y = \frac{x^2-3}{x^2-2}$
12. The graph of which function below has a horizontal asymptote?
- A.  $y = \frac{x^2-7x+12}{x+7}$       B.  $y = \frac{x^2-3}{x+7}$       C.  $y = \frac{x^2+3}{x^2-2}$       D.  $y = \frac{x^2}{x+3}$
13. What is the equation of the vertical asymptote of the graph of this function?
- $$y = \frac{x+4}{x^2+10x+25}$$
- A.  $x = -5$       C.  $x = -4$   
 B.  $x = 0$       D. The graph has no vertical asymptote.

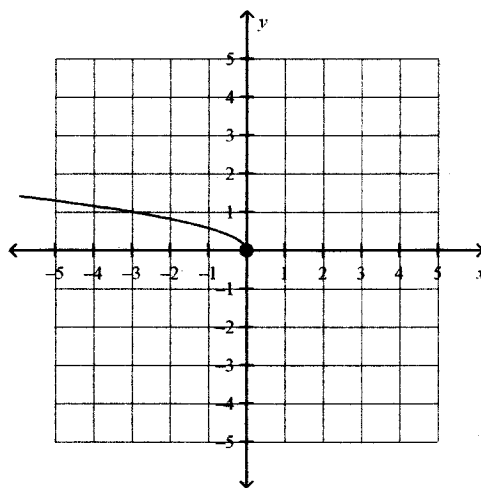
14. For the graph of  $y = f(x)$  shown below, which graph best represents  $y = \sqrt{f(x)}$ ?



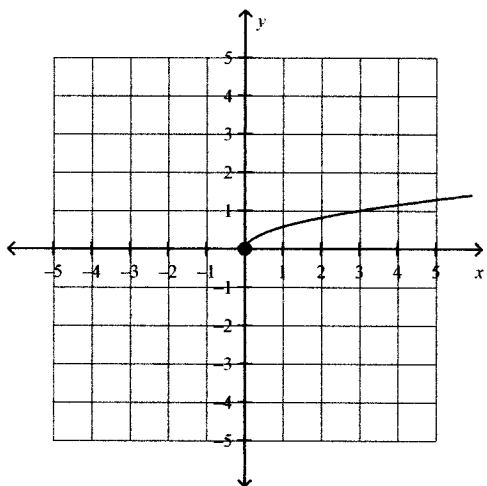
A.



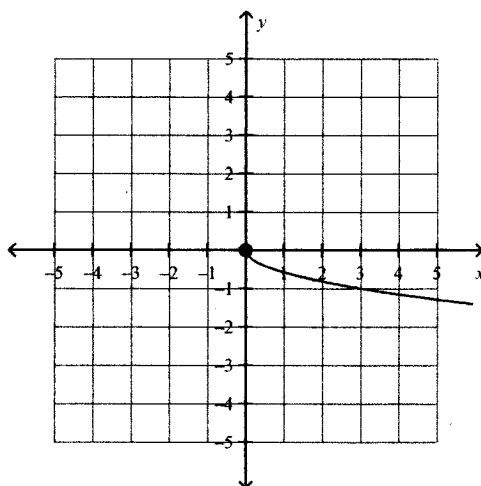
C.



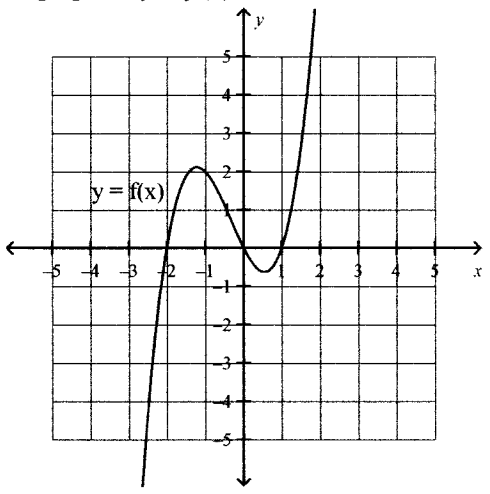
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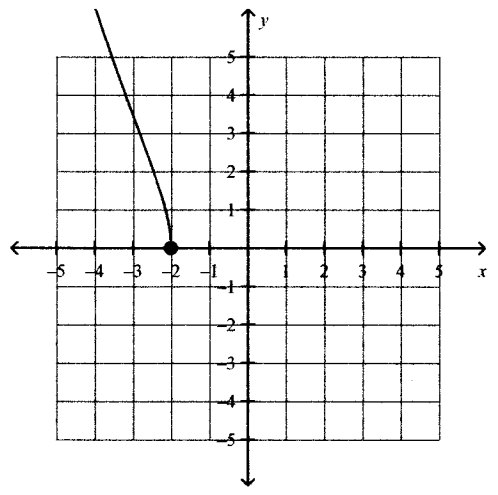
D.



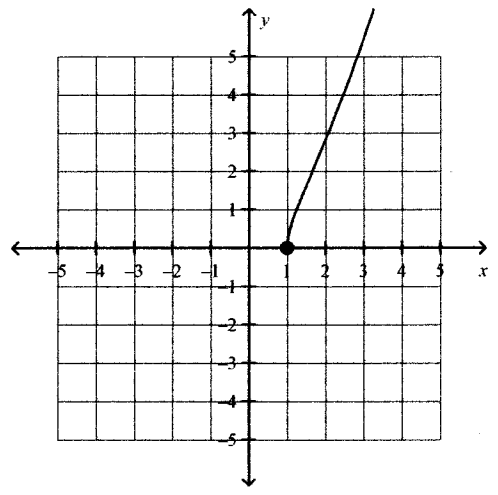
15. For the graph of  $y = f(x)$  shown below, which graph best represents  $y = \sqrt{f(x)}$ ?



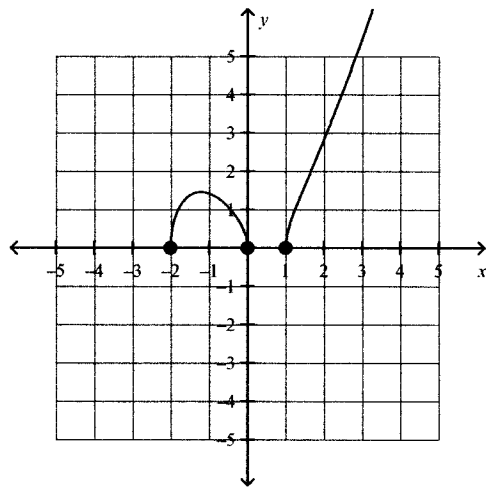
A.



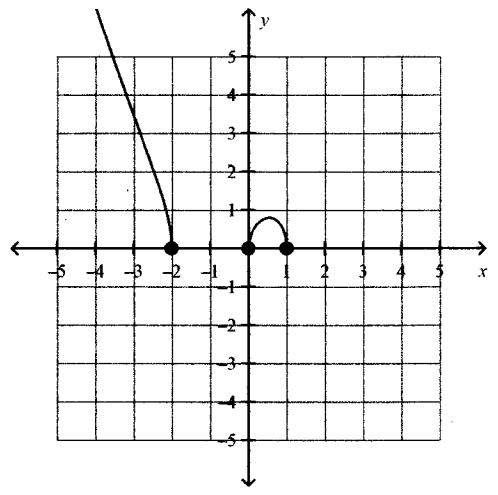
C.



B.

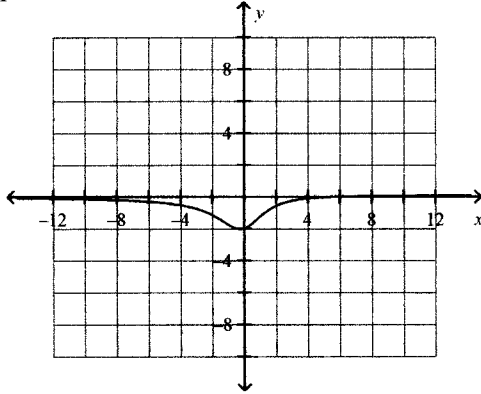


D.



16. For the graph of this rational function, state the domain and write the equations of any asymptotes.

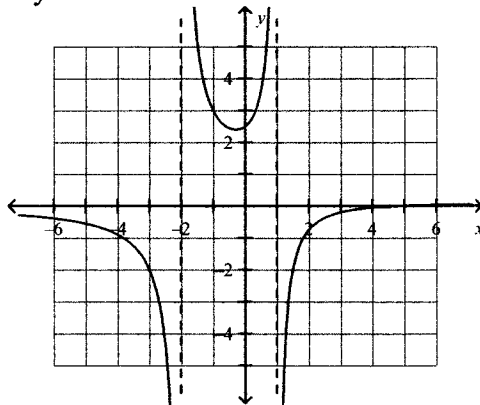
$$y = \frac{x-6}{x^2+3}$$



- A. domain:  $x \in \mathbb{R}$ ;  
horizontal asymptote:  $y = 0$
- B. domain:  $x \neq -3$ ;  
horizontal asymptote:  $y = 0$
- C. domain:  $x \neq 0$ ;  
vertical asymptote:  $x = 0$
- D. domain:  $x \in \mathbb{R}$ ;  
no vertical or horizontal asymptotes

17. For the graph of this rational function, state the domain and write the equations of any asymptotes and the coordinates of any hole.

$$y = \frac{x-5}{x^2+x-2}$$



- A. domain:  $x \neq 1$  and  $x \neq -2$ ;  
vertical asymptotes:  $x = 1, x = -2$ ;  
horizontal asymptote:  $y = 1$
- B. domain:  $x \neq 1$  and  $x \neq -2$ ;  
hole:  $(-2, -7)$   
vertical asymptote:  $x = 1$ ;  
horizontal asymptote:  $y = 0$
- C. domain:  $x \neq 0$ ;  
hole:  $(0, -7)$   
vertical asymptote:  $x = 0$ ;  
horizontal asymptote:  $y = 0$
- D. domain:  $x \neq 1$  and  $x \neq -2$ ;  
vertical asymptotes:  $x = 1, x = -2$ ;  
horizontal asymptote:  $y = 0$

18. For the graph of this rational function, identify the equations of any asymptotes and the coordinates of any hole

$$y = \frac{x^2 + 5x + 6}{x - 3}$$

- A. The graph has a hole at (3,30).
- B. The graph has a vertical asymptote at  $x = 3$ , and an oblique asymptote at  $y = x - 3$ .
- C. The graph has a vertical asymptote at  $x = 3$ , and an oblique asymptote at  $y = x + 8$ .
- D. The graph has a horizontal asymptote at  $y = 0$ .

19. What is the solution of this radical equation, to the nearest tenth if necessary?

$$\frac{4}{x-1} = -8$$

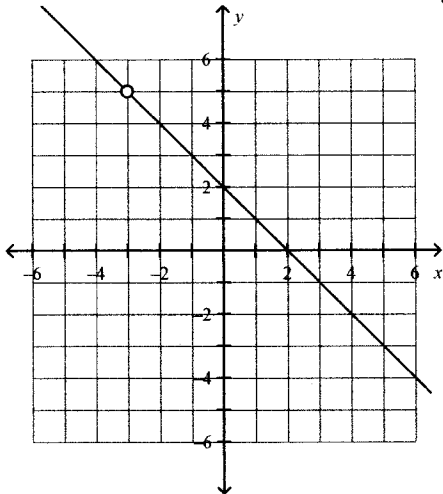
- A.  $x \doteq 1.5$
- B.  $x \doteq 0.5$
- C.  $x \doteq -1.5$
- D.  $x \doteq -0.5$

20. State the domain of this function.

$$y = \frac{x^2 + 7x + 10}{-2 - x}$$

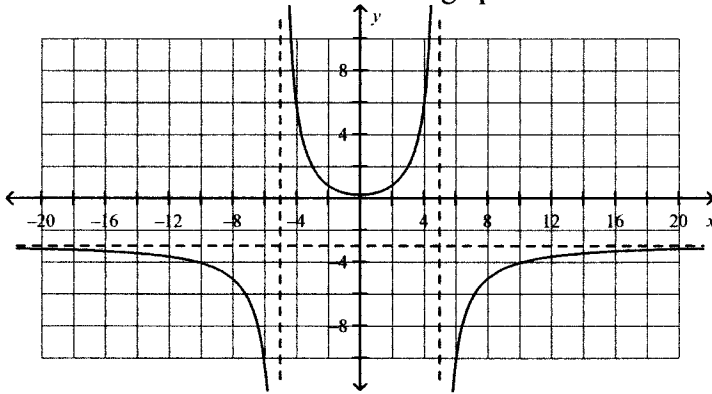
- A.  $x \neq \pm 2$
- B.  $x \neq -2$
- C.  $x \neq -2, x \neq -5$
- D.  $x \in \mathbb{R}$

21. Which function below describes this graph?



- A.  $y = \frac{-x^2 - x + 6}{x - 3}$
- B.  $y = \frac{-x^2 - x + 6}{x + 3}$
- C.  $y = \frac{-x^2 + 6x + 1}{x + 3}$
- D.  $y = \frac{x + 3}{-x^2 - x + 6}$

22. Which function below describes this graph?



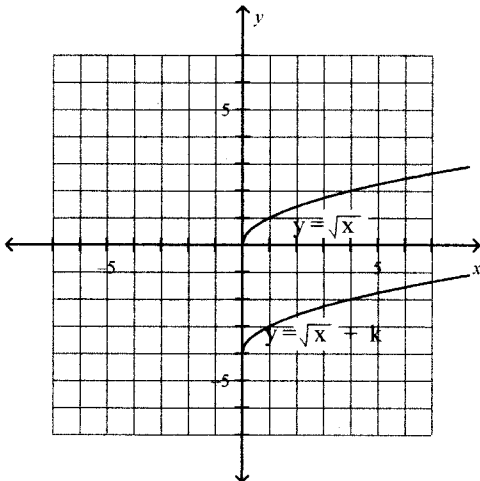
A.  $y = \frac{-3x^2 - 5}{x^2 - 25}$

C.  $y = \frac{-3x^2 - 5}{x^2 + 5}$

B.  $y = \frac{2x^2 - 5}{x^2 - 25}$

D.  $y = \frac{-3x^2 - 5}{x^2}$

23. The graph of  $y = \sqrt{x} + k$  is the image of the graph of  $y = \sqrt{x}$  after a single translation. What is the value of  $k$ ?



- A. 5  
B. -4

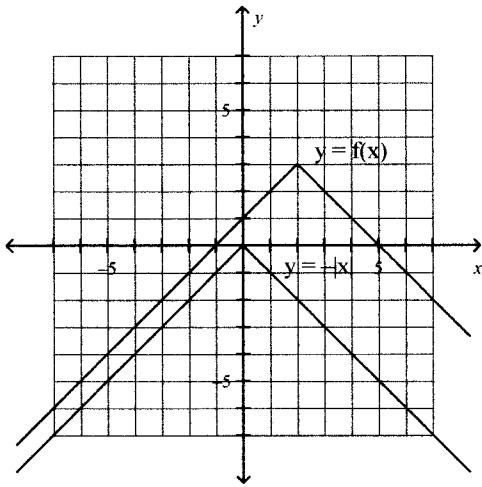
- C. 4  
D. -5

24. The graph of  $y = f(x)$  is translated 4 units down. What is the equation of the translation image in terms of the function  $f$ ?

- A.  $y = f(x + 4)$   
B.  $y + 4 = f(x)$

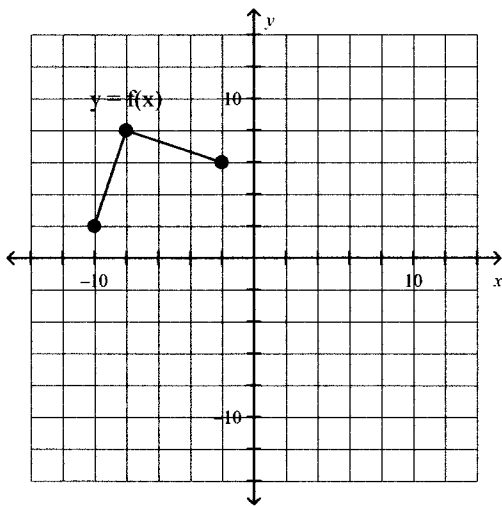
- C.  $y - 4 = f(x)$   
D.  $y = f(x - 4)$

25. The graph of  $y = f(x)$  is the image of the graph of  $y = -|x|$  after a horizontal and vertical translation. What is an equation of the image graph?



- A.  $y - 3 = -|x|$       B.  $y - 3 = -|x - 2|$       C.  $y - 3 = |x + 2|$       D.  $y - 2 = -|x - 3|$

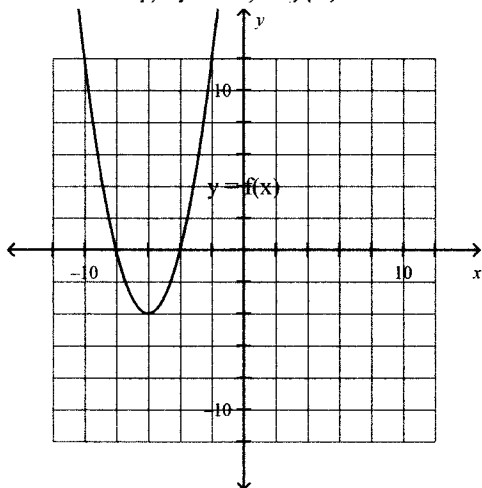
26. Here is the graph of  $y = f(x)$ . What are the domain and range of its image after a reflection in the  $x$ -axis?



- A. domain:  $-10 \leq x \leq -2$   
range:  $-8 \leq y \leq -2$
- B. domain:  $2 \leq x \leq 10$   
range:  $2 \leq y \leq 8$
- C. domain:  $2 \leq x \leq 10$   
range:  $-8 \leq y \leq -2$
- D. domain:  $-10 \leq x \leq -2$   
range:  $2 \leq y \leq 8$

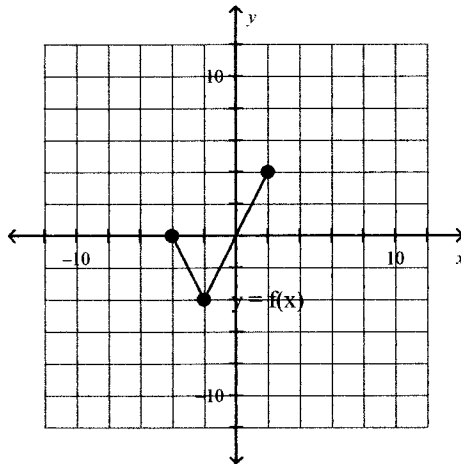


27. Here is the graph of  $y = f(x)$ . What are the domain and range of  $y = -f(x)$ ?

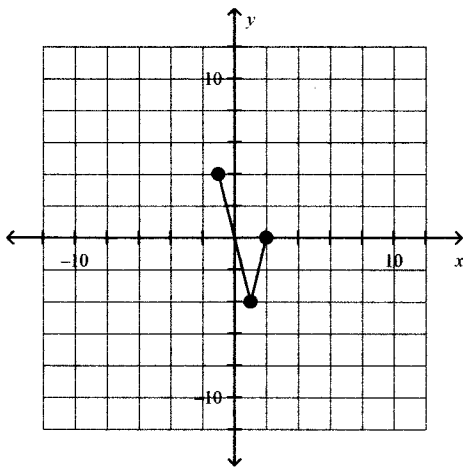


- A. domain:  $x \in \mathbb{R}$   
range:  $y \leq -4$
- B. domain:  $x \in \mathbb{R}$   
range:  $y \leq 4$
- C. domain:  $x \leq 6$   
range:  $y \geq 4$
- D. domain:  $x \in \mathbb{R}$   
range:  $y \in \mathbb{R}$
28. The graph of  $y = f(x)$  is stretched vertically by a factor of 6. What is the equation of the image graph in terms of the function  $f$ ?
- A.  $y = 6f(x)$
- B.  $y = \frac{1}{6}f(x)$
- C.  $y = f(6x)$
- D.  $y = f(\frac{1}{6}x)$
29. The point A (16, 64) lies on the graph of  $y = \sqrt{x^3}$ . What are the coordinates of its image A' on the graph of  $y = \frac{1}{4}\sqrt{(2x)^3}$ ?
- A. (8, 16)
- B. (8, 32)
- C. (4, 16)
- D. Not enough information is given.
30. The graph of  $y = f(x)$  is horizontally compressed by a factor of  $\frac{1}{3}$ , vertically compressed by a factor of  $\frac{1}{2}$ , and reflected in the y-axis. What is an equation of the image graph in terms of the function  $f$ ?
- A.  $y = \frac{1}{2}f(-3x)$
- B.  $y - 3 = f(x - \frac{1}{2})$
- C.  $y - \frac{1}{2} = f(x - 3)$
- D.  $y = -3f(\frac{1}{2}x)$

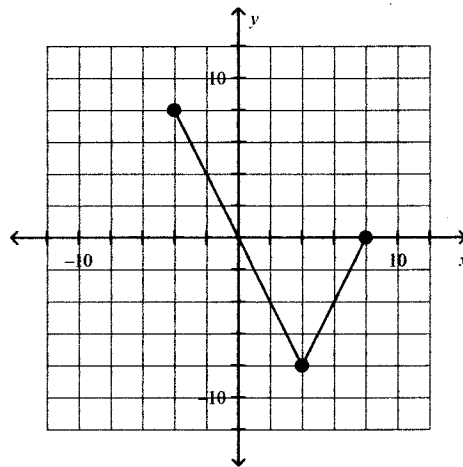
31. For the graph of  $y = f(x)$  shown below, which graph represents  $y = f(-2x)$ ?



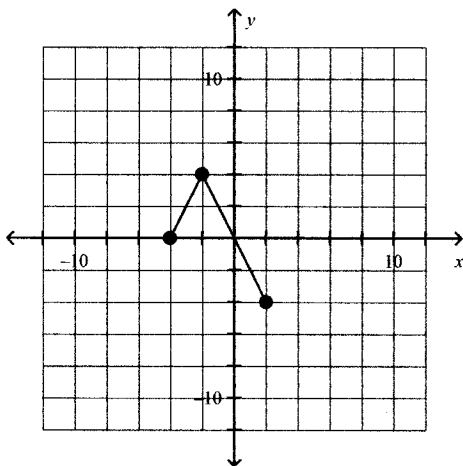
A.



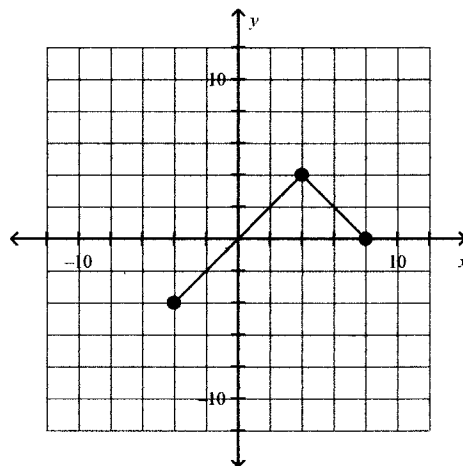
C.



B.



D.

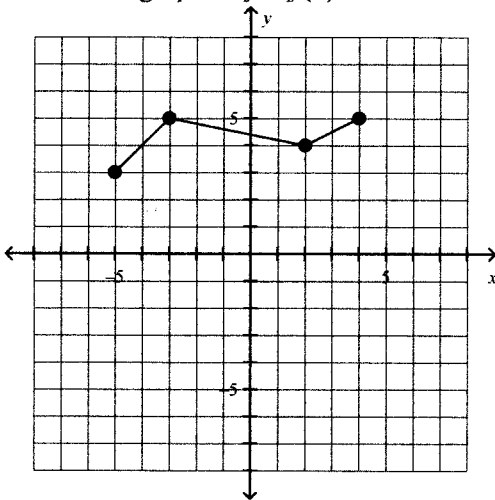


32. Which statement below describes how the graph of  $y = f(x)$  has been transformed to get the graph of  $y = f(-\frac{1}{3}(x-2))$ ?

It is the image of the graph of  $y = f(x)$  after:

- A. a vertical compression by a factor of  $\frac{1}{3}$ , a reflection in both axes, and a translation of 2 units right.
- B. a vertical stretch by a factor of 3, a reflection in the y-axis, and a translation of 2 units down.
- C. a horizontal stretch by a factor of 3, a reflection in the y-axis, and a translation of 2 units right.
- D. a horizontal compression by a factor of  $\frac{1}{3}$ , a reflection in the y-axis, and a translation of 2 units right.

33. Here is the graph of  $y = f(x)$ . What are the domain and range of its inverse?



- A. Domain:  $-5 \leq x \leq 4$   
Range:  $-5 \leq y \leq -3$
- B. Domain:  $3 \leq x \leq 5$   
Range:  $-5 \leq y \leq 4$
- C. Domain:  $-5 \leq x \leq 4$   
Range:  $3 \leq y \leq 5$
- D. Domain:  $3 \leq x \leq 5$   
Range:  $-4 \leq y \leq 5$

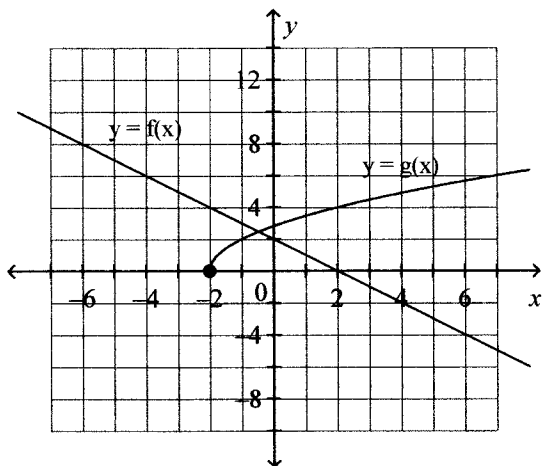
34. Determine an equation of the inverse of the function  $y = -6x - 5$ .

- A.  $y = \frac{x-6}{-5}$
- B.  $y = \frac{x-5}{-6}$
- C.  $y = -6x + 5$
- D.  $y = \frac{x+5}{-6}$

35. The point  $A(-5, -3)$  lies on the graph of  $y = f(x)$ . What are the coordinates of its image  $A'$  on the graph of  $y = f^{-1}(x)$ ?

- A. (3, 5)
- B. (5, 3)
- C. (-3, -5)
- D. (-5, -3)

36. Use the graphs of  $y = f(x)$  and  $y = g(x)$ . What are the domain and range of  $y = f(x) - g(x)$ ?



- A. Domain:  $x \in \mathbb{R}$   
Range:  $y \leq -2$
- B. Domain:  $x \leq -2$   
Range:  $y \leq 4$
- C. Domain:  $x \geq -2$   
Range:  $y \in \mathbb{R}$
- D. Domain:  $x \geq -2$   
Range:  $y \leq 4$

37. Given  $f(x) = x - 1$  and  $g(x) = 3x^2 + 2$ , what is an explicit equation for  $p(x) = f(x) \cdot g(x)$ ?

- A.  $p(x) = 4x^3 + 3x^2 + 2x - 2$
- B.  $p(x) = 3x^2 + x + 1$
- C.  $p(x) = 3x^2 - x - 2$
- D.  $p(x) = 3x^3 - 3x^2 + 2x - 2$

38. Given  $f(x) = x + 2$  and  $g(x) = x^2 - 25$ , what is the domain of  $q(x) = \frac{f(x)}{g(x)}$ ?

- A.  $x \neq 25$
- B.  $x \neq 5, x \neq -5$
- C.  $x \neq -2$
- D.  $x \in \mathbb{R}$

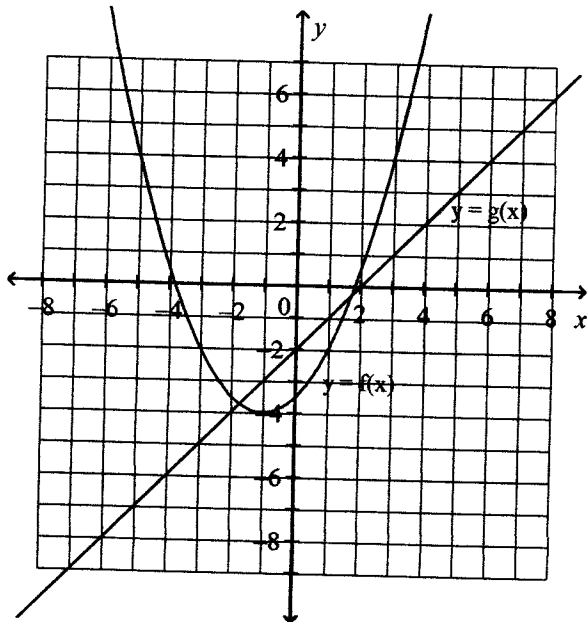
39. Given  $h(x) = 5x^2 + 2x - 3$ , which pair of equations below are possible equations for  $f(x)$  and  $g(x)$  so that  $h(x) = f(x) - g(x)$ ?

- A.  $f(x) = 5x^2$   
 $g(x) = 2x - 3$
- B.  $f(x) = 4x^2$   
 $g(x) = x^2 + 2x - 3$
- C.  $f(x) = 4x^2$   
 $g(x) = -x^2 - 2x - 3$
- D.  $f(x) = 5x^2$   
 $g(x) = -2x + 3$

40. Given  $f(x) = |x - 5|$  and  $g(x) = \frac{1}{x}$ , what is the domain and range of  $h(x) = f(x) + g(x)$ ?

- A. Domain:  $x \neq 0$   
Range:  $y \in \mathbb{R}$
- B. Domain:  $x \geq 5$   
Range:  $y \leq 5$
- C. Domain:  $x \neq 0$   
Range:  $y \leq 5$
- D. Domain:  $x \neq 5$   
Range:  $y \in \mathbb{R}$

41. Given the graphs of  $y = f(x)$  and  $y = g(x)$ , what is the value of  $f(g(3))$ ?



- A. 4
- B. -2
- C. 2
- D. -4

42. Given  $f(x) = \sqrt{4 - x}$  and  $g(x) = 3 - 5x$ , what is an explicit equation for  $f(g(x))$ ?

- A.  $f(g(x)) = 3 - \sqrt{4 - 5x}$
- B.  $f(g(x)) = 1 - \sqrt{4 - 5x}$
- C.  $f(g(x)) = \sqrt{1 - 5x}$
- D.  $f(g(x)) = \sqrt{5x + 1}$

43. Use these tables. What is the value of  $f(f(0))$ ?

$x$	$f(x)$
-3	18
-2	11
-1	6
0	3
1	2
2	3
3	6

- A. -2                      B. 6                      C. 2                      D. 0

44. The function  $h(x) = g(f(x))$  is the composite of  $f(x) = 2 - x$  and  $g(x) = \frac{1}{\sqrt{x}}$ .

What is the domain of  $h(x)$ ?

- A.  $-2 < x < 0$                       C.  $x < -2$  or  $x > 0$   
B.  $x < 2$                       D.  $x > 0$

45. Given  $f(x) = \sqrt{2-x}$  and  $g(x) = x^2 + 6x - 3$ , which is an explicit equation for the composite function  $h(x) = g(f(x))$ , and what is its domain?

- A.  $h(x) = \sqrt{-x^2 - 6x + 5}$   
 $x \geq 0$   
B.  $h(x) = -1 - x$   
 $x \in \mathbb{R}$   
C.  $h(x) = \sqrt{-1 - x}$   
 $x \leq -1$   
D.  $h(x) = -1 - x + 6\sqrt{2-x}$   
 $x \leq 2$

46. Which exponential function is increasing?

- A.  $y = \left(\frac{1}{4}\right)^x$                       C.  $y = 0.1^x$   
B.  $y = \left(\frac{4}{3}\right)^x$                       D.  $y = 0.137^x$

47. This table of values represents an exponential function. Determine the missing value.

$x$	$y$
-2	0.0025
-1	0.05
0	

- A. 20  
B. 1  
C. 2  
D. 0.0975
48. The graph of  $y - 3 = 5^{x+3}$  is the image of the graph of  $y = 5^x$  after it has been
- A. translated 3 units right and 3 units down.  
B. translated 3 units left and 3 units up.  
C. translated 3 units right and 3 units up.  
D. translated 3 units left and 3 units down.

49. Write  $\frac{\sqrt[4]{2}}{256}$  as a power of 2.

- A.  $2^{\frac{33}{4}}$   
B.  $2^{-32}$   
C.  $2^{-2}$   
D.  $2^{\frac{-31}{4}}$

50. Solve:  $125^{-2x} = 25^{x-24}$

- A.  $x = 6$   
B.  $x = 8$   
C.  $x = \frac{25}{3}$   
D.  $x = 3$

## PMATH 12 - MIDTERM (Ch 1-5.3) - PRACTICE QUESTIONS

### Answer Section

#### MULTIPLE CHOICE

1. ANS: D	DIF: Moderate	REF: 1.1 Dividing a Polynomial by a Binomial
2. ANS: C	DIF: Moderate	REF: 1.1 Dividing a Polynomial by a Binomial
3. ANS: D	DIF: Moderate	REF: 1.1 Dividing a Polynomial by a Binomial
4. ANS: D	DIF: Easy	REF: 1.2 Factoring Polynomials
5. ANS: D	DIF: Moderate	REF: 1.2 Factoring Polynomials
6. ANS: C	DIF: Easy	REF: 1.3 Graphing Polynomial Functions
7. ANS: C	DIF: Easy	REF: 1.4 Relating Polynomial Functions and Equations
8. ANS: D	DIF: Moderate	REF: 1.4 Relating Polynomial Functions and Equations
9. ANS: D	DIF: Easy	
	REF: 1.5 Modelling and Solving Problems with Polynomial Functions	
10. ANS: D	DIF: Moderate	REF: 2.1 Properties of Radical Functions
11. ANS: B	DIF: Easy	REF: 2.2 Math Lab: Graphing Rational Functions
12. ANS: C	DIF: Easy	REF: 2.2 Math Lab: Graphing Rational Functions
13. ANS: A	DIF: Moderate	REF: 2.2 Math Lab: Graphing Rational Functions
14. ANS: B	DIF: Easy	REF: 2.1 Properties of Radical Functions
15. ANS: B	DIF: Moderate	REF: 2.1 Properties of Radical Functions
16. ANS: A	DIF: Easy	REF: 2.3 Analyzing Rational Functions
17. ANS: D	DIF: Easy	REF: 2.3 Analyzing Rational Functions
18. ANS: C	DIF: Moderate	REF: 2.3 Analyzing Rational Functions
19. ANS: B	DIF: Moderate	REF: 2.3 Analyzing Rational Functions
20. ANS: B	DIF: Easy	REF: 2.4 Sketching Graphs of Rational Functions
21. ANS: B	DIF: Moderate	REF: 2.4 Sketching Graphs of Rational Functions
22. ANS: A	DIF: Moderate	REF: 2.4 Sketching Graphs of Rational Functions
23. ANS: B	DIF: Easy	REF: 3.1 Translating Graphs of Functions
24. ANS: B	DIF: Easy	REF: 3.1 Translating Graphs of Functions
25. ANS: B	DIF: Moderate	REF: 3.1 Translating Graphs of Functions
26. ANS: A	DIF: Moderate	REF: 3.2 Reflecting Graphs of Functions
27. ANS: B	DIF: Moderate	REF: 3.2 Reflecting Graphs of Functions
28. ANS: A	DIF: Easy	REF: 3.3 Stretching and Compressing Graphs of Functions
29. ANS: A	DIF: Moderate	REF: 3.3 Stretching and Compressing Graphs of Functions
30. ANS: A	DIF: Moderate	REF: 3.4 Combining Transformations of Functions
31. ANS: A	DIF: Easy	REF: 3.3 Stretching and Compressing Graphs of Functions
32. ANS: C	DIF: Easy	REF: 3.4 Combining Transformations of Functions
33. ANS: B	DIF: Easy	REF: 3.5 Inverse Relations
34. ANS: D	DIF: Easy	REF: 3.5 Inverse Relations
35. ANS: C	DIF: Easy	REF: 3.5 Inverse Relations
36. ANS: D	DIF: Moderate	REF: 4.1 Combining Functions Graphically
37. ANS: D	DIF: Easy	REF: 4.2 Combining Functions Algebraically
38. ANS: B	DIF: Easy	REF: 4.2 Combining Functions Algebraically



39.	ANS: D	DIF: Easy	REF: 4.2 Combining Functions Algebraically
40.	ANS: A	DIF: Moderate	REF: 4.2 Combining Functions Algebraically
41.	ANS: B	DIF: Easy	REF: 4.3 Introduction to Composite Functions
42.	ANS: D	DIF: Easy	REF: 4.3 Introduction to Composite Functions
43.	ANS: B	DIF: Easy	REF: 4.3 Introduction to Composite Functions
44.	ANS: B	DIF: Easy	REF: 4.4 Determining Restrictions on Composite Functions
45.	ANS: D	DIF: Moderate	REF: 4.4 Determining Restrictions on Composite Functions
46.	ANS: B	DIF: Easy	REF: 5.2 Analyzing Exponential Functions
47.	ANS: B	DIF: Easy	REF: 5.2 Analyzing Exponential Functions
48.	ANS: B	DIF: Moderate	REF: 5.2 Analyzing Exponential Functions
49.	ANS: D	DIF: Moderate	REF: 5.3 Solving Exponential Equations
50.	ANS: A	DIF: Moderate	REF: 5.3 Solving Exponential Equations