

## PRE-CALCULUS FIRST SEMESTER STUDY GUIDE

1. What are the domain and range of the relation  $\{(4, -1), (4, 1), (3, 2)\}$ ?

Is the relation a function? Choose *yes* or *no*.

A.  $D = \{-1, 1, 2\}; R = \{1, 2\}$ ; no    B.  $D = \{4, 3, 2\}; R = \{-1, 1\}$ ; yes

C.  $D = \{4, 3\}; R = \{-1, 1, 2\}$ ; no    D.  $D = \{4, -1, 3, 2\}; R = \{1\}$ ; no

2. If  $f(x) = \frac{1}{x+2}$  and  $g(x) = 3x$ , find  $(f - g)(x)$ .

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

3. If  $f(x) = x^2 + 1$  and  $g(x) = x + 2$ , find  $[f \circ g](x)$ .

A.  $x^2 + 4$     B.  $x^2 + 5$     C.  $x^2 + 4x + 4$     D.  $x^2 + 4x + 5$

4. Solve algebraically.  $5x - y = 16$

$$2x + 3y = 3$$

A. (4, 4)    B. (-1, 3)    C. (9, -5)    D. (3, -1)

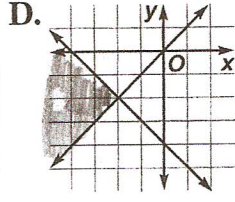
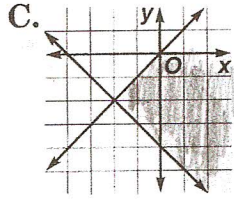
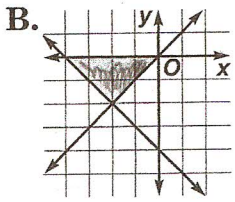
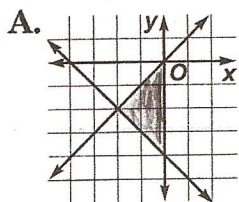
5. Solve algebraically.  $x - 3y - 3z = 0$

$$2x + 5y - 5z = 1$$

$$-x + 5y - 6z = -9$$

A. (3, 4, -3)    B. (3, 0, 1)    C. (-2, 4, 3)    D. (0, -3, 3)

6. Which is the graph of the system?  $y \leq 0$      $x \geq y$   
 $x \leq 0$      $x + y \geq -4$



7. The graph of the equation  $y = x^4 - 3x^2$  is symmetric with respect to which of the following?

A. the  $x$ -axis    B. the  $y$ -axis    C. the origin    D. none of these

8. If the graph of a function is symmetric with respect to the  $y$ -axis, which of the following must be true?

A.  $f(x) = f(-x)$     B.  $f(x) = -f(x)$     C.  $f(x) = |f(x)|$     D.  $f(x) = \frac{1}{f(x)}$

9. The graph of an even function is symmetric with respect to which of the following?

A. the  $x$ -axis    B. the  $y$ -axis    C. the line  $y = x$     D. none of these

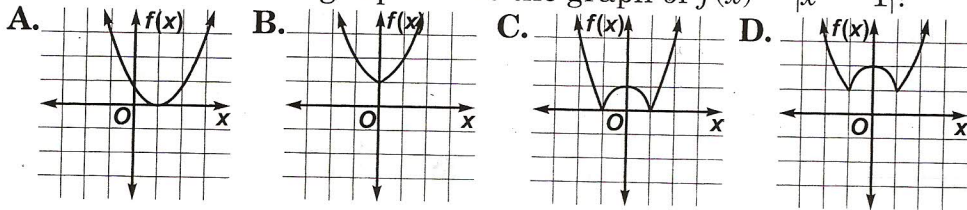
10. Given the parent function  $p(x) = x^2$ , what translations occur in the graph of  $p(x) = (x - 7)^2 + 3$ ?

A. right 7 units, up 3 units    B. down 7 units, left 3 units  
 C. left 7 units, up 3 units    D. right 7 units, down 3 units

11. Which of the following results in the graph of  $f(x) = x^3$  being expanded vertically by a factor of 3?

- A.  $f(x) = x^3 + 3$  B.  $f(x) = \frac{1}{3}x^3$  C.  $f(x) = 3x^3$  D.  $f(x) = -\frac{1}{3}x^3$

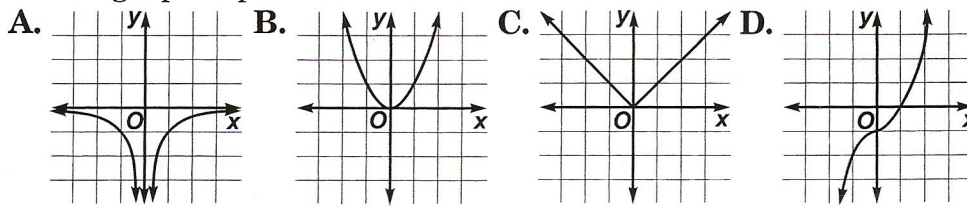
12. Which of the following represents the graph of  $f(x) = |x^2 - 1|$ ?



13. Find the inverse of  $f(x) = \frac{1}{x-2}$ .

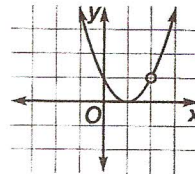
- A.  $f^{-1}(x) = \frac{1}{x-2}$  B.  $f^{-1}(x) = \frac{1}{x} + 2$   
 C.  $f^{-1}(x) = x + 2$  D.  $f^{-1}(x) = \frac{1}{x} - 2$

14. Which graph represents a function whose inverse is also a function?



15. Which type of discontinuity, if any, is shown in the graph at the right?

- A. jump B. infinite  
 C. point D. The graph is continuous.



16. Describe the end behavior of  $f(x) = 2x^3 - 5x + 1$

- A.  $x \rightarrow \infty, f(x) \rightarrow \infty$   
 $x \rightarrow -\infty, f(x) \rightarrow -\infty$   
 B.  $x \rightarrow \infty, f(x) \rightarrow \infty$   
 $x \rightarrow -\infty, f(x) \rightarrow \infty$   
 C.  $x \rightarrow \infty, f(x) \rightarrow -\infty$   
 $x \rightarrow -\infty, f(x) \rightarrow \infty$   
 D.  $x \rightarrow \infty, f(x) \rightarrow -\infty$   
 $x \rightarrow -\infty, f(x) \rightarrow -\infty$

17. Choose the statement that is true for the graph of  $f(x) = -(x-2)^2$ .

- A.  $f(x)$  increases for  $x > -2$ . B.  $f(x)$  decreases for  $x > -2$ .  
 C.  $f(x)$  increases for  $x < 2$ . D.  $f(x)$  decreases for  $x < 2$ .

18. Which type of critical point, if any, is present in the graph of  $f(x) = (-x+4)^3$ ?

- A. maximum B. minimum  
 C. point of inflection D. none of these

19. Which is true for the graph of  $f(x) = x^3 - 3x + 2$ ?

- A. relative maximum at (1, 0) B. relative minimum at (-1, 4)  
 C. relative maximum at (-1, 4) D. relative minimum at (0, 2)

20. Use the Remainder Theorem to find the remainder when  $2x^3 + 6x^2 + 3x - 1$  is divided by  $x - 1$ . State whether the binomial is a factor of the polynomial.

- A. 0; yes B. -2; no C. 10; no D. -1; yes

21. Use synthetic division to divide  $x^3 + 5x^2 + 5x - 2$  by  $x + 2$ .  
A.  $x^2 + 7x + 19$  R36      B.  $x^2 + 3x - 1$   
C.  $x^2 + 4$       D.  $x^2 + 7x - 9$  R16

22. Determine the rational roots of  $x^3 + 4x^2 + 6x + 9 = 0$ .  
A.  $-3$       B.  $\pm 3$       C.  $3$       D.  $\pm 3, 9$

23. Find the discriminant of  $5x^2 - 8x - 3 = 0$  and describe the nature of the roots of the equation.  
A. 4; two distinct real roots      B. 0; exactly one real root  
C.  $-76$ ; no real roots      D. 124; two distinct real roots

24. Solve  $\sqrt{x + 2} - 2 \geq 7$ .  
A.  $-2 \leq x \leq 79$       B.  $x \leq -2, x \geq 79$   
C.  $x \geq -2$       D.  $x \geq 79$

25. Decompose  $\frac{-2x - 23}{2x^2 - 9x - 5}$  into partial fractions.  
A.  $\frac{4}{2x + 1} - \frac{3}{x - 5}$       B.  $\frac{4}{2x + 1} + \frac{3}{x - 5}$   
C.  $\frac{3}{x - 5} - \frac{4}{2x + 1}$       D.  $\frac{-3}{2x + 1} + \frac{4}{x - 5}$

26. Find the polynomial equation of least degree with roots  $-1, 3,$  and  $\pm 3i$ .  
A.  $x^4 - 2x^3 - 6x - 9 = 0$   
B.  $x^4 + 2x^3 + 6x^2 + 18x - 27 = 0$   
C.  $x^4 - 2x^3 + 6x^2 - 18x - 27 = 0$   
D.  $x^4 - 2x^3 - 12x^2 + 18x + 27 = 0$

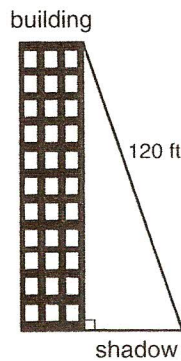
27. Identify the coterminal angle between  $-360^\circ$  and  $360^\circ$  for the angle  $-120^\circ$ .  
A.  $-240^\circ$       B.  $60^\circ$       C.  $240^\circ$       D.  $300^\circ$

28. Find the measure of the reference angle for  $295^\circ$ .  
A.  $25^\circ$       B.  $-65^\circ$       C.  $-25^\circ$       D.  $65^\circ$

29. Find the value of  $\sec \theta$  for angle  $\theta$  in standard position if the point at  $(-2, -4)$  lies on its terminal side.  
A.  $\frac{\sqrt{5}}{2}$       B.  $\sqrt{5}$       C.  $-\frac{\sqrt{5}}{2}$       D.  $-\sqrt{5}$

30. Suppose  $\theta$  is an angle in standard position whose terminal side lies in Quadrant III. If  $\sin \theta = -\frac{12}{13}$ , find the value of  $\cot \theta$ .  
A.  $-\frac{5}{13}$       B.  $-\frac{13}{5}$       C.  $\frac{5}{12}$       D.  $\frac{13}{12}$

For Exercises 31 and 32, refer to the figure. The angle of elevation from the end of the shadow to the top of the building is  $56^\circ$  and the distance is 120 feet.



- 31 Find the height of the building to the nearest foot.  
A. 99 ft            B. 67 ft  
C. 178 ft          D. 81 ft
- 32 Find the length of the shadow to the nearest foot.  
A. 99 ft            B. 67 ft  
C. 178 ft          D. 81 ft
- 
33. In  $\triangle ABC$ ,  $A = 41^\circ 15'$ ,  $B = 107^\circ 39'$ , and  $c = 19$ . Find  $b$ .  
A. 10.0            B. 24.3            C. 35.1            D. 54.6
34. If  $A = 52.6^\circ$ ,  $B = 49.8^\circ$ , and  $a = 33.8$ , find the area of  $\triangle ABC$ .  
A. 117.9 units<sup>2</sup>   B. 338.2 units<sup>2</sup>   C. 536.4 units<sup>2</sup>   D. 1072.8 units<sup>2</sup>
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35. In  $\triangle ABC$ ,  $B = 52^\circ$ ,  $a = 14$ , and  $c = 9$ . Find  $b$ .  
A. 8.2            B. 11.0            C. 11.1            D. 18.4
36. In  $\triangle ABC$ ,  $a = 7.8$ ,  $b = 4.2$ , and  $c = 3.9$ . Find  $A$ .  
A.  $15.1^\circ$           B.  $78.9^\circ$           C.  $148.7^\circ$           D.  $16.2^\circ$
37. If  $a = 32$ ,  $b = 26$ , and  $c = 40$ , find the area of  $\triangle ABC$ .  
A. 49 units<sup>2</sup>      B. 121.0 units<sup>2</sup>   C. 298.6 units<sup>2</sup>   D. 415.2 units<sup>2</sup>

