

**Math 121****Exam 2**

Justify all answers with neat and organized work. Clearly indicate your answers.  
100 points possible.

1. (5 pts.) Find the product.

$$(x + 2)^3$$

2. (5 pts.) Find the standard form of the equation of the specified circle.

Endpoints of a diameter:  $(0, 0)$ ,  $(16, 12)$

3. (5 pts.) Solve the quadratic equation for  $x$  by **factoring**.

$$x^2 + 10x + 25 = 0$$

4. (5 pts.) Solve the quadratic equation for  $x$  by **factoring**.

$$x^2 + 4x = 12$$

5. (5 pts.) Solve the quadratic equation for  $x$  by **completing the square**.

$$9x^2 - 18x = -4$$

6. (5 pts.) Find all solutions of the equation. Check your solutions in the original equation.

$$|2x - 3| = 8$$

7. (5 pts.) Find all solutions of the equation. Check your solutions in the original equation.

$$|x| = x^2 + x - 3$$

8. (5 pts.) Solve the inequality and sketch the solution on the real number line.

$$\frac{3}{4} > x + 1 > \frac{1}{2}$$

9. (5 pts.) Solve the inequality and sketch the solution on the real number line.

$$|x - 20| \leq 4$$

10. (5 pts.) Of the following statements, which one best expresses the same meaning as  $|x - 5| > 8$ ?

- A.  $x - 5 < 8$  and  $x - 5 > -8$
- B.  $x - 5 > 8$  and  $x - 5 < -8$
- C.  $x - 5 < 8$  or  $x - 5 > -8$
- D.  $x - 5 > 8$  or  $x - 5 < -8$

11. (5 pts.) Graph the solution of this inequality on the real number line.

$$3(x - 1)(x + 1) > 0$$

12. (5 pts.) Graph the solution of this inequality on the real number line.

$$x^2 + 4x + 4 \geq 9$$

13. (5 pts.) Find an equation of the line passing through the points and sketch a graph of the line.

$$(1, 2), \quad (3, 5)$$

14. (5 pts.) Write an equation of the line through the given point *perpendicular* to the given line.

$$(5, 7) \quad 8x - 2y = 3$$

15. (5 pts.) A rectangular package with square cross section to be sent by a postal service can have a maximum combined length plus girth (perimeter of a square cross section) of 120 inches (see figure). Write the volume of the package as a function of the width  $w$ .

16. (5 pts.) Let  $f(x) = x^2$  and  $g(x) = x + 9$ . Find  $f \circ g$ .

17. (5 pts.) Find the inverse of the function  $f$ .

$$f(x) = 4x + 7$$

18. (5 pts.) Use the method of completing the square to write this quadratic function in the “standard form”  $f(x) = a(x - h)^2 + k$ . Then write down the vertex of the graph.

$$f(x) = 2x^2 - 12x + 73$$

19. (5 pts.) Find the quadratic function that has the indicated vertex and whose graph passes through the given point.

$$\text{Vertex: } (5, 12); \text{ Point: } (7, 15)$$

20. (5 pts.) Divide by long division.

$$(6x^3 + 10x^2 + x + 8) \div (2x^2 + 1)$$