**Week 4 Math 1508 Review for Exam 1**

**[Chapter 1]**

1. Find the distance between the two points and find the midpoint of the line segment joining the two points.
   a. $(-1,2),(4,6)$

$$Distance = \sqrt{41}$$
$$midpoint = \left(\frac{3}{2}, 4\right)$$

   b. $\left(\frac{1}{2}, 1\right), \left(-\frac{5}{2}, \frac{4}{3}\right)$

$$Distance = \frac{\sqrt{82}}{3}$$
$$midpoint = \left(-1, \frac{7}{6}\right)$$

2. Find the x- and y-intercepts of the graph of the equations.
   a. $y = x^2 + x - 30$

$$x - intercepts: (-6,0) and\ (5,0),\quad y - intercept: (-30,0)$$

   b. $y = \sqrt{x - 30}$

$$x - intercepts: (30,0),\qquad There\ is\ no\ y - intercept.$$

3. Write the standard form of the equation of the circle with the given characteristics.
   Center: (2,-1); Radius: 6

$$(x-2)^2 + (y+1)^2 = 36$$

4. Write the equation of the lines through the given point (a) parallel to and (b) perpendicular to the given line.
   a. $2x - 4y = 3,\ (3,4)$

$$parallel: y = \frac{1}{2}x + \frac{5}{2}$$
$$perpendicular: y = -2x + 10$$

   b. $2x - 5y = 15,\ \left(\frac{1}{2}, -\frac{3}{4}\right)$

$$parallel: y = \frac{2}{5}x - \frac{19}{20}$$

$$perpendicular: y = -\frac{5}{2}x + \frac{1}{2}$$

5. Evaluate the function at each specified value if possible.
   a. $f(x) = \sqrt{x^2 - x}$, at $x = -2$

   $$f(-2) = \sqrt{6}$$

   b. $f(x) = -x^2 + 3x + 21$, at $x = -5$

   $$f(-5) = -19$$

   c. $f(x) = \begin{cases} 3x - 5 & x < 2 \\ x^2 + 5x - 1 & x \geq 2 \end{cases}$, at $x = 2$

   $$f(2) = 13$$

   d. $f(x) = \begin{cases} 3x - 5 & x < 2 \\ x^2 + 5x - 1 & x \geq 2 \end{cases}$, at $x = -2$

   $$f(-2) = -11$$

6. Find the zeros of the functions algebraically
   a. $f(x) = \frac{x^2+4x-21}{x+3}$

   $$x = -7, x = 3$$

   b. $f(x) = 25 - \frac{3}{x^2}$

   $$x = -\frac{\sqrt{3}}{5}, x = \frac{\sqrt{3}}{5}$$

7. Consider the function $f(x) = \sqrt{x - 5}$ and $g(x) = \frac{1}{9+x}$. Find the following
   a. The domain of $f(x)$

   $$Domain: [5, \infty)$$

   b. The domain of $g(x)$

   $$Domain: (-\infty, -9) \cup (-9, \infty)$$

   c. The domain of the composite function $g(f(x))$

   $$Domain: (5, \infty)$$

8. Consider the function $f(x) = \sqrt[3]{x + 4}$ and $g(x) = x^3$. Find the following
   a. $g(f(-12))$

   $$g(f(-12)) = -8$$

   b. $f(g(-2))$

   $$f(g(-2)) = \sqrt[3]{-4}$$

9. Find the inverse of the following functions algebraically.

a. $f(x) = \sqrt{3x-5}$

$$f^{-1}(x) = \frac{x^2+5}{3}, where\ x \geq \frac{5}{3}$$

b. $f(x) = \frac{x-3}{3x+5}$

$$f^{-1}(x) = \frac{5x+3}{1-3x}$$

c. $f(x) = 4 - 7x^3$

$$f^{-1}(x) = \sqrt[3]{\frac{x-4}{-7}}$$

10. Identify the vertex, axis of symmetry and x-intercepts for the following quadratic functions

a. $f(x) = 8x^2 - 22x - 21$

$$Vertex: \left(\frac{11}{8}, -\frac{289}{8}\right)$$

$$Axis\ of\ Symmetry: x = \frac{11}{8},$$

$$x - intercepts: \left(\frac{7}{2}, 0\right), \left(-\frac{3}{4}, 0\right)$$

b. $f(x) = 10x^2 + 17x + 3$

$$Vertex: \left(-\frac{17}{20}, -\frac{169}{40}\right)$$

$$Axis\ of\ Symmetry: x = -\frac{17}{20},$$

$$x - intercepts: \left(-\frac{3}{2}, 0\right), \left(-\frac{1}{5}, 0\right)$$

11. Use the given zero to find all the zeros of the function

a. $f(x) = 2x^3 - 5x^2 + 8x - 20$ with zero: $2i$

$$x = 2i, x = -2i, and\ x = \frac{5}{2}$$

b. $f(x) = x^4 + 3x^3 - 5x^2 - 21x + 22$ with zero: $-3 + i\sqrt{2}$

$$x = -3 + i\sqrt{2}i, x = -3 - i\sqrt{2}i, and\ x = 1, x = 2$$

12. Find all real zeros of the function

a. $f(x) = x^2 - 13x + 12$

$x = 1, x = 12$

b. $f(x) = 2x^4 - 15x^3 + 23x^2 + 15x - 25$

$x = -1, x = 1, x = 5, x = \frac{5}{2}$

13. Perform the operation and write the result in standard form

a. $(23 - 4i) - (5 + 11i)$

$18 - 15i$

b. $(3 - 7i)(7 - 7i)$

$-28 - 70i$

c. $(5 - 4i)^2$

$9 - 40i$

d. $\frac{i}{2+3i} - \frac{2i}{5-8i}$

$\frac{477}{1157} + \frac{48}{1157}i$