Name: _____

Answer the following questions on a separate sheet of paper. Algebraic support must be shown to receive full credit (i.e. show work!). Answers should be exact unless otherwise stated.

1: (15 pts.) If $f(x) = \sqrt{x+3}$ and $g(x) = 2x^2 - 5x$, find the following:

(a): $(f-g)(1)$

(b): $(fg)(-2)$

(c): $(g \circ f)(x)$. What is the domain of $g \circ f$?

2: (20 pts.) Consider the function $h(x) = \frac{1}{4}(x-3)^2 + 6$.

(a): Identify the parent function and describe the transformations on h (shifts, stretches, etc.).

(b): Use this description to sketch a graph of h (label at least 3 points).

(c): You should notice from your sketch that h is not one-to-one. Identify a domain restriction so that h is one-to-one (should be of the form $x \geq a$ for some number a).

(d): Find h^{-1} on this domain. Sketch a graph of h^{-1} along with the restricted graph of h (label 3 points on each) to verify they are symmetric over the line $y = x$.

3: (15 pts.) Consider the system of linear equations

$$\begin{cases} 4x - 2y &= -4 \\ -2x + 3y &= 18 \end{cases}$$

(a): Find the $x-$ and $y-$intercepts for each equation, and use these intercepts to graph the two lines (label the intercepts on the graph).

(b): Algebraically solve the system of equations given by the two lines, and label the intersection point on the graph you drew.

4: (15 pts.) Consider the circle given by the equation $(x+2)^2 + (y-1)^2 = 4$.

(a): Find the center and radius of the circle.

(b): Find the $x-$ and $y-$intercepts of the graph of the circle.

5: (15 pts.) Given the piecewise-defined function

$$p(x) = \begin{cases} -2x - 3, & x \leq 0 \\ x - 4, & 0 < x \leq 3. \end{cases}$$

(a): Sketch a graph of $p(x)$. Label at least 3 points.

(b): **(b)** Use the graph to determine the domain and range of p.

6: (10 pts.) Write the equation of a line through the point $(-1, -3)$ that is perpendicular to the line $x + 2y = 10$.

7: (10 pts.) Determine algebraically whether the function $f(x) = x^3 + x$ is even, odd, or neither.

Bonus: (10 pt.) Find (algebraically) the domain of the function $d(x) = \frac{1}{\sqrt{6+x-x^2}}$.