Name: _____

Answer the following questions on a separate sheet of paper. Clearly number each problem, and write your name on each sheet of paper you turn in. Algebraic support must be shown to receive full credit (i.e. show work!). Answers should be exact unless otherwise stated.

1: (15 pts.) Consider the two points $(-3, 5)$ and $(1, 3)$.

(a): Find the exact distance between the points.

(b): Algebraically determine the equation of the line that passes through the points. Leave your answer in slope-intercept form.

2: (15 pts.) Solve the following system of linear equations algebraically using **matrix row-reduction** techniques (show and explain all steps, but don't forget to check your answer on the calculator).

$$\begin{cases} -x + y - z = -14 \\ 2x - y + z = 21 \\ 3x + 2y + z = 19 \end{cases}$$

3: (20 pts.) Consider the function $g(x) = -4(x+1)^2 + 4$.

(a): Identify the parent function and describe each of the transformations on g.

(b): Use the transformations to sketch a graph of g by hand.

4: (15 pts.) Graph the lines $y_1 = 4(x+1)$ and $y_2 = 2x+3$. Solve the inequality $y_1 < y_2$ algebraically, and illustrate your answer on the graph.

5: (20 pts.) Suppose that f is the piecewise-defined function given by

$$f(x) = \begin{cases} x+3, & -5 \leq x < -1 \\ 2, & -1 \leq x < 0 \\ x^2 + 2, & 0 \leq x \leq 2. \end{cases}$$

(a): Sketch a detailed graph of $f(x)$, complete with labels and at least three points (hint: does your graph pass the vertical line test? If not, something must be wrong, because f is a function).

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

(c): Use the graph to determine the intervals on which f is increasing, decreasing, and constant.

6: (15 pts.) Let $f(x) = 2x$ and $g(x) = x + 5$.

(a): Find $h = f \circ g$.

(b): Find the inverse function of h algebraically.

Bonus: (10 pts.) Evaluate the expression $\frac{f(x+h)-f(x)}{h}$ for the function $f(x) = x^2 - 3x$. Simplify!