MAT 1340 Midterm
140 points Covers Chapters 1 - 2

(5 pts) Print Your Name_____

Do your own work. Show all your work. Circle final answers. Organize your work for efficient processing, left to right, top to bottom.

Required Materials: Bring pencil/pen, and scientific calculator.

Paper will be provided. Do not take anything from the test with you. Turn in your work, cheat sheet, and any scratch pages to the proctor. You should not make a separate scratch sheet. EVERYTHING you do related to a given question should be included with the work on that question, including your scratch work.

This isn't about fitting perfect answers in tiny boxes. This is about supporting your work in a readable and cogent fashion.

Do all your work on the blank paper provided. All I'm looking for on test-questions pages is your NAME. Other than your name, there are no points given or deducted for anything you write on the test-questions pages. Every bit of work should be on the blank pages provided, and will be thoroughly processed for every possible point of credit I can award.

The only difference between this test and your Written Assignments is that you don't have to write out the question on a test. No annoying "Context" deductions.

1. (10 pts) Sketch the feasible region for the following system of inequalities. Go Big!
   $3x-5y\le 15$
   $4x+2y<8$
   $x\ge -1$
   $y\ge -3$
   Find and label all corner points.

2. (10 pts) Use the converse of the Pythagorean Theorem to show that the triangle with vertices $A=(4,5), B=(-1,2),$ and $C=(10,-5)$ is a right triangle.

3. Solve the absolute-value inequalities.

   a. (5 pts) $|5x-8|>7$

   b. (5 pts) $|5x-8|\le 7$

   c. (5 pts) $|5x-8|>-7$

   d. (5 pts) $|5x-8|\le -7$

4. The equation $x^2 + y^2 - 6x - 12y = -9$ represents a circle.

   a. (5 pts) Write the equation of the circle in standard form. What is the center? What is the radius?

   b. (5 pts) Sketch the graph of the circle. Label the North, South, East and West Poles.

   c. (**Bonus 5 pts**) Find the *x*- and *y*-intercepts of the circle.

5. Let $f(x) = \dfrac{1}{x-3}$, $g(x) = \sqrt{x-8}$, and $h(x) = x^2 + 2x$

   a. (5 pts) Find the domain of *f*, *g*, and *h*.

   b. (5 pts) Find $f + g$ and state its domain.

   c. (5 pts) Find $g \circ h$ and state its domain.

   d. (5 pts) Find $f \circ h$ and state its domain.

6. Let $A = (4, 2)$ and $B = (3, -8)$.

   a. (5 pts) Find an equation $y = m(x - x_1) + y_1$ of the line passing through *A* and *B*.

   b. (5 pts) Find an equation of the line $y = m(x - x_1) + y_1$ passing through (10, - 7) that is parallel to the line from part a.

   c. (5 pts) Find an equation of the line $y = m(x - x_1) + y_1$ passing through (10, - 7) that is perpendicular to the line from part a.

7. Consider the quadratic function $f(x) = 3x^2 - 2x - 1$.

   a. (5 pts) Solve the equation $f(x) = 0$ using the Quadratic Formula. For full credit, evaluate the discriminant and its square root, first. I'm looking for exact answers, not decimal approximations.

   b. (5 pts) Solve the equation $f(x) = 0$ by completing the square. Find the exact solution. Do not use a calculator.

   c. (5 pts) Solve the equation $f(x) = 0$ by factoring.

   d. (5 pts) Write $f(x)$ in standard form $f(x) = a(x - h)^2 + k$ and sketch its graph. Include the *x*- and *y*-interepts, as well as the vertex in your graph.

e. (5 pts) What is the domain of f? What is the range of f?

8. (**Bonus 5 pts**) Factor $140x^2 - 111x - 198$.

9. (5 pts) Solve the equation $\frac{3x+1}{x-3} = \frac{-8}{x-6}$ for x.

10. (5 pts) Solve the inequality $\frac{3x+1}{x-3} > \frac{-8}{x-6}$ for x.

11. Let $f(x) = \frac{1}{x-2}$.

a. (5 pts) Show that f is 1-to-1.

b. (5 pts) Find the inverse $f^{-1}(x)$.

c. (**Bonus 5 pts**) Sketch the graph of $f(x)$ and the graph of $f^{-1}(x)$ on the same set of coordinate axes. You may use $y = x$ as a guide. Use an extra-thick line for the graph of $f(x)$ to distinguish it from $f^{-1}(x)$.

d. (5 pts) State the domain and range of f and the inverse f^{-1}