Math 101 **May 13, 2004**

Final Exam

Name:_____ Instructor and Section:_____

There are 200 possible points on this exam. Be sure to read each question carefully and answer the question asked. Show your work neatly and clearly– untidy answers and/or answers without justification may reduce your score. Partial credit may be given for a correct approach even if you don't get to the right answer. Give exact answers unless otherwise asked.

No calculators are allowed

GOOD LUCK!

Problem	Max	Score
1	25	
2	25	
3	20	
4	10	
5	20	
6	20	
7	20	
8	20	
9	20	
10	20	
TOTAL	200	

1. (25 points) Simplify the following expressions. Your answer should consist of a single simple fraction in lowest terms or a variable expression involving no fractions. Answers should contain no absolute value bars, no negative exponents and no radicals in the denominator.

(a) $\dfrac{3-5(2-3)^3}{(-1)^2+|3-6|}$

(b) $\dfrac{2-\frac{1}{x+1}}{\frac{1}{x+1}}$

(c) $6\sqrt{3} - 3\sqrt{12}$

(d) $\dfrac{2}{\sqrt{5} - \sqrt{3}}$

(e) $\dfrac{3x^5}{x^{1/2}(x^5)^{1/2}}$

2. (25 points) Find all solutions, if any, to each of the following equations or systems of equations.

(a) $$\begin{aligned} 2x - y &= 7 \\ 5x + y &= 7 \end{aligned}$$

(b) $$\frac{x+2}{3} - \frac{2x-2}{5} = 1$$

(c) $x - \sqrt{x^2 + 3} = 0$

(d) $3x - 2y = 3$
$9x - 6y = 9$

(e) $$-\frac{2}{x+1}+\frac{3}{2+x-x^2}=-\frac{3}{2-x}$$

3. (20 points) Find the solution sets for the following inequalities

(a) $x + 3 \geq 4$ OR $-x + 3 > 2$

(b) $|1 - 2x| < 2$

(c) $|5x + 7| + 4 \leq -1$

(d) $\frac{x+3}{2} > \frac{x+2}{4}$

4. (10 points) Evaluate the following, do not leave your answer in scientific notation.

$$\frac{1.2 \times 10^{-4}}{0.6 \times 10^{-7}}$$

5. (20 points) Let $f(x)$ be a polynomial of degree 1 such that $f(1) = 5$ and $f(-1) = 1$

   (a) Find $f(x)$

   (b) Let $g(x) = x + 3$.
   Compute $(f(x) + g(x))^2 - (f(x) - g(x))^2 - 4f(x)g(x) - 1$.

6. (20 points)

(a) Write down an equation for the line which contains the point (-1,3) and has a slope of $-\sqrt{4}$.

(b) What are the x and y intercepts?

(c) Write down the equations for the lines parallel and perpendicular to this one and contain the point (2,3).

7. (20 points) Solve the following equations:

(a) $\sqrt{x^2 - 2x + 5} = x + 1$

(b) $\sqrt{x+2} - \sqrt{x-2} = 2$

8. Patrick averages 50 mph driving from Madison to Chicago to see a concert. On the way back he speeds up in order to catch the last episode of Friends and averages 75 mph. He notices that on the way back his time improved by an hour. Find the distance from Madison to Chicago.

   (a) (5 points) Write down the correct relation between rate, distance and time.

   (b) (5 points) Deduce an equation that incorporates the information given in the problem.

   (c) (10 points) Solve the equation and check your answer.

9. (20 points) Solve the following equations:

(a) $x^2 - 2x - 1 = 0$

(b) $15x^2 - 16x + 4 = 0$

10. Find the lengths of the sides of a right triangle knowing that the length of first leg is 4 less than twice the length of the second leg and the hypotenuse is 2 more than the first leg.

(a) (5 points) Draw a sketch of a triangle and correctly label the sides of the triangle.

(b) (5 points) Use the information from the first part to write down an equation that leads to the sollution.

(c) (10 points) Solve the equation in order to find the lengths of the sides and verify your answer.