

First Midterm for Math 230

October 3, 2007

Last Name: \_\_\_\_\_ First Name: \_\_\_\_\_

Discussion Session(Your TA's name): \_\_\_\_\_

1. Evaluate the integral

(a) (10 points)

$$\int_{\frac{1}{2}}^1 \frac{3}{\sqrt{1-x^2}} dx;$$

(b) (10 points)

$$\int_0^{\infty} 2xe^{-3x} dx;$$

(c) (10 points)

$$\int \frac{x}{x^2 + 3x + 2} dx;$$

2. (15 points) Find the length of the curve

$$y = 1 + 2x^{\frac{3}{2}}, 0 \leq x \leq 4.$$

3. (15 points) Set up an integral representing the volume of the solid formed by rotating the region bounded by  $y = (x - 1)^2$  and  $y = 2x + 1$  about  $y$ -axis. You are not required to evaluate the integral.

4. (15 points) Solve the initial value differential equation

$$y' = x^2(y + 1), y(0) = 5.$$

5. (10 points) Using Euler's method with step size  $h = \frac{1}{4}$  to approximate  $y\left(\frac{1}{2}\right)$  if

$$y' = 4x + y, y(0) = 8.$$

6. (15 points) A parabolic tank with upper radius  $2m$  and height  $4m$  is full of water. Determine the work required to pump the water out of the tank. Setup the integral only, evaluation of the integral is not required. (Use the fact that the density of water is  $1000kg/m^3$  and the acceleration of gravity is  $g = 10m/sec^2$ .)