Math 2280 - Final Exam Part 1

Instructor: Dylan Zwick

Spring 2008

Name: _____

50 Points Possible

Note - This is the half of the exam that is closed book. Before you open your book you need to hand this part of the exam in. You can look at the second half and start working on it before you hand in this part, but you can't open your book until you hand this part in.

1. Answer the following:

   a) What is the order of the following differential equation: (4 points)
   $$2\sin xy^{(3)} - y'y'' + x^5 y - 2e^{\cos x^2} = 15y'$$

   b) Circle the terms that describe the following differential equation:
   (2 points)
   $$\sin xy^3 + 4e^x y = 15x^2$$

   linear / nonlinear

   homogeneous / nonhomogeneous

2. Solve the following initial value problem: (6 points)

$$y' + 5y = 0$$
$$y(0) = 7$$

3. Using Euler's method with a step size of 1 estimate the value of $y(2)$ given the initial value problem: (6 points)

$$\frac{dy}{dx} = x^2 + y^2 - 2xy$$

$$y(0) = 2$$

4. Solve the following initial value problem: (7 points)

$$y'' + 3y' - 10y = 0$$

$$y(0) = 2 \ y'(0) = 1$$

5. Solve the following system of differential equations with the given initial values: (7 points)

$$x_1' = x_1 + 8x_2$$
$$x_2' = 2x_1 + x_2$$
$$x_1(0) = 0 \; x_2(0) = 4$$

Continued...

6. Using the definition of the Laplace transform calculate the Laplace transform of the following function: (6 points)

$$f(t) = 2t$$

7. Determine if the point $x = 0$ in the following second order differential equation is an ordinary point, a regular singular point, or an irregular singular point. (6 points)

$$x^3 y'' + 6 \sin x y' + 6xy = 0$$

8. Graph the even extension of the following function:

$$f(t) = t$$
$$0 \le t \le 1$$