

Math 242, Exam 2, Spring, 2017 11:40 class

Write everything on the blank paper provided. **You should KEEP this piece of paper.** If possible: return the problems in order (use as much paper as necessary), use only one side of each piece of paper, and leave 1 square inch in the upper left hand corner for the staple. If you forget some of these requests, don't worry about it – I will still grade your exam.

The exam is worth 50 points. Each problem is worth 10 points. Please make your work coherent, complete, and correct. Please CIRCLE your answer. Please **CHECK** your answer whenever possible.

The solutions will be posted later today. The exams will be returned in class on Tuesday, Feb. 28.

**No Calculators or Cell phones.**

- (1) Consider the initial value problem  $\frac{dy}{dx} = y + \frac{1}{x}$ ,  $y(2) = 1$ . Use Euler's method to approximate  $y(22/10)$ . Use two steps, each of size  $1/10$ .
- (2) Consider a tank with 200 liters of salt-water solution, 30 grams of which is salt. A brine solution with a concentration of 1 gram of salt per liter is pouring into the tank at the rate of 4 liters/minute. The "well-mixed" solution pours out of the tank at a rate of 5 liters/minute. Find the amount of salt in the tank at time  $t$ . SET UP THE INITIAL VALUE PROBLEM. DO NOT SOLVE THE INITIAL VALUE PROBLEM.
- (3) Solve  $\frac{dy}{dx} - (4x - y + 1)^2 = 0$ . Express your answer in the form  $y = y(x)$ . Please check your answer.
- (4) Solve  $\frac{dy}{dx} = (y - 2)(3 - y)$ . Express your answer in the form  $y = y(x)$ . Draw some of the solutions of this Differential Equation for various values of  $y(0)$ .
- (5) Find all constants  $r$  for which  $y = e^{rx}$  a solution of  $y'' - 4y' + 3y = 0$ . Find a constant  $A$  with  $y = Ae^{2x}$  a solution of  $y'' - 4y' + 3y = e^{2x}$ . What is the general solution of  $y'' - 4y' + 3y = e^{2x}$ ?