Math 242, Exam 2, Spring, 2018

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 $\boxed{CIRCLE}$ your answer. Please **CHECK** your answer whenever possible.

The solutions will be posted on Saturday. The exam will be returned in class on Tuesday.

No Calculators or Cell phones.

(1) A motor boat is moving at 40 feet per second when its motor suddenly quits and 10 seconds later the boat has slowed to 20 feet/second. The only force acting on the boat is resistance and resistance is proportional to velocity. How far will the boat coast in all?

(2) Solve $yy' + x = \sqrt{x^2 + y^2}$. Express your answer in the form $y(x)$. **Check your answer.**

(3) Consider the initial value problem $\frac{dy}{dx} = x + \frac{2}{y}$, $y(1) = 3$. Use Euler's method to approximate $y(12/10)$. Use two steps, each of size $1/10$. Label all intermediate calculations clearly and correctly.

(4) Solve the Initial Value Problems $\frac{dx}{dt} = x(x-4)$ with $x(0) = x_0$. Draw some of the solutions.

(5) Solve the Initial Value Problem

$$y'' + y = 3x, \quad y(0) = 2, \quad y'(0) = -2.$$

You might want to notice that $y_1 = \sin x$ and $y_2 = \cos x$ are solutions of the corresponding homogeneous problem and $y_{\text{particular}} = 3x$ is a solution of the given Differential Equation. **Check your answer.**