

Math 242, Exam 2, Spring, 2021

Write everything on the blank paper that you brought. There should be nothing on your desk except this exam, the blank paper that you brought, and a pen or pencil. When you are finished, send a picture of your solutions to

kustin@math.sc.edu

**ALSO, LEAVE A PHYSICAL COPY OF YOUR SOLUTIONS WITH ME.** Fold your solutions in half and write your name on the outside.

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.

(1) A 1000 gallon holding tank that catches runoff from some chemical process initially has 800 gallons of water with 2 ounces of pollution dissolved in it. Polluted water flows into the tank at a rate of 3 gal/hr and contains 5 ounces/gal of pollution in it. A well mixed solution leaves the tank at 3 gal/hr as well. Give an Initial Value Problem for the number of ounces of pollution in the tank at time  $t$  hours. **Do not solve** the Initial Value Problem.

(2) Solve the Initial Value Problem:

$$\frac{dy}{dx} - \frac{2y}{x} + x^2y^2 = 0 \quad \text{and} \quad y(1) = \frac{5}{11}.$$

Put your answer in the form  $y = y(x)$ . **Please check your answer.**

(3) Solve the Initial Value Problem:

$$xy \frac{dy}{dx} + 4x^2 + y^2 = 0 \quad \text{and} \quad y(2) = -7.$$

Put your answer in the form  $y = y(x)$ . **Please check your answer.**

(4) Solve the Initial Value Problem:

$$y'' - 4y' + 4y = 0, \quad y(0) = 1, \quad \text{and} \quad y'(0) = 4.$$

Put your answer in the form  $y = y(x)$ . **Please check your answer.**

(5) Suppose that a motorboat is moving at 50 feet per second when its motor suddenly quits and that 10 seconds later the boat has slowed to 30 feet per second. Assume that the only force acting on the boat is resistance and that resistance is proportional to velocity. How far will the boat coast in all?