

Math 242, Exam 1, Spring 2017, 1:15 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.

No Calculators or Cell phones.

- (1) Solve the initial value problem $\frac{dy}{dx} = \frac{xy^3}{\sqrt{1+x^2}}$, $y(0) = -1$. Express your answer in the form $y = y(x)$. Please check your answer.
- (2) The number of bacteria in a liquid culture is observed to grow at a rate proportional to the number of cells present. At the beginning of the experiment there are 10,000 cells and after three hours there are 500,000. How many will there be after one day of growth if this unlimited growth continues? What is the doubling time of the bacteria? Set up an initial value problem. Solve the initial value problem.
- (3) Consider the initial value problem $\frac{dy}{dx} = x + \frac{1}{y}$, $y(1) = 2$. Use Euler's method to approximate $y(12/10)$. Use two steps, each of size $1/10$.
- (4) Find the general solution of $\frac{dy}{dx} + y = e^{-x}$. Express your answer in the form $y = y(x)$. Please check your answer.
- (5) Suppose that a motor boat is moving at 60 feet/second when its motor suddenly quits and that 10 seconds later the boat has slowed to 40 feet/second. Assume that the only force acting on the boat is resistance and resistance is proportional to velocity. How far will the boat travel in all? Set up an initial value problem. Solve the initial value problem.