Math 242,   Exam 1,   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 later today.

No Calculators or Cell phones.

(1) Solve the initial value problem $\frac{dy}{dx} = ye^x$, $y(0) = 2e$. Express your answer in the form $y = y(x)$. Please check your answer.

(2) Solve $3y^2 \frac{dy}{dx} + y^3 = e^{-x}$. Express your answer in the form $y = y(x)$. Please 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 $1/10$.

(4) A 120-gallon tank initially contains 90 lb of salt dissolved in 90 gal of water. Brine containing 2 lb/gal flows into the tank at the rate of 4 gal/min and the well-mixed mixture flows out of the tank at the rate of 3 gal/min. How much salt is in the tank when the tank is full?

(5) The acceleration of a car is proportional to the difference between 200 ft/sec and the velocity of the car. If this car can accelerate from 0 to 40 ft/sec in 2 seconds, how long will it take for the car to accelerate from rest to 150 ft/sec? Set up an initial value problem. Solve the initial value problem.