Math 302
Spring 2020
Practice Exam 2

Name (Print): _____

Time Limit: 50 Minutes

Problem	Points	Score
1	30	
2	40	
3	45	
Total:	115	

No notes
No calculators
Simplify when possible
Show your work
Cheating will not be tolerated

Homework:
Classwork:
Current Grade:

1. A 1000 gallon tank has 10 pounds of salt. A hole is made in the bottom of the tank and brine spills out at a rate of 3 gallons per minute. At the same time, 2 gallons of brine containing one pound of salt per gallon is continuously added to the tank every minute. There are genetically modified trout of negligible volume added to the tank to ensure that the mixture is homogenized.

   (a) (15 points) Find a function that gives the amount of salt after a given time, $x(t)$.
   Warning: The resulting differential equation is not separable, but it is, indeed, solvable with the methods learned in this class.

   (b) (15 points) At what time will the tank have the most salt?

2. Solve.

(a) (10 points)

$$y'' + 3y = 0$$

(b) (10 points)

$$y'' - 4y' + 4y = 0$$

(c) (10 points)

$$y'' + y' + y = 0.$$

(d) (10 points)

$$y''' - 4y'' - 5y' = 0.$$

3. (a) (15 points) Give a general solution for the following DE:

$$y'' - 6y' + 8y = 3x^2 + 1$$

(b) (15 points) Give a general solution for the following DE:

$$y'' - 2y' + y = 4e^x + 5x^2 + 2$$

(c) (15 points) Give a general solution for the following DE:

$$y'' + y = -\cos(x)$$