Math 242, Final Exam , Spring, 2017 11:40 class

Write everything on the blank paper provided. **You should RETURN this piece of paper to me.** 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 100 points.

Please make your work coherent, complete, and correct.

Please $\boxed{CIRCLE}$ your answer.

Please CHECK your answer whenever possible.

No Calculators or Cell phones.

(1) (15 points) A cake has the temperature 400 degrees when it is taken from the oven and placed on the kitchen table in a room whose temperature is 70 degrees. Twenty minutes later the temperature of the cake is 300 degrees. When will the temperature of the cake be 80 degrees? Use Newton's law of cooling which says that if a hot small object is placed in a large cooler environment, then that the rate at which an object cools is proportional to the difference between the temperature of the object and the temperature of the large cooler environment.

(2) (15 points) A tank contains 4 pounds of salt dissolved in 100 gallons of water. Suppose that brine containing 2 pounds of salt per gallon of brine enters the tank at a rate of 5 gallons per minute and that the mixed solution is drained from the tank at the same rate. Write an Initial Value Problem whose solution is the amount of salt in the tank at time t. **You do not have to solve the Initial Value Problem.**

(3) (14 points) Find the general solution of $\frac{dy}{dx} + 4xy = x$.

(4) (14 points) Find the general solution of $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} - 12y = e^{6x}$.

(5) (14 points) Find $\mathcal{L}(\sin^2 x)$.

(6) (14 points) Find $\mathcal{L}^{-1}\left(\frac{s+1}{s^2+2s+5}\right)$.

(7) (14 points) Find $\mathcal{L}^{-1}\left(\ln\left(\frac{s+1}{s-2}\right)\right)$.