You may attach additional pages if you wish. Use both sides of the paper. Label the problems clearly and indicate your final answer/s clearly. Work alone on these problems.

HOMEWORK 4 – Problem 3 has been changed

DUE DATE: Friday 25 September

Modeling (3.1, 3.2)

1) You take a pie out of the oven when it’s at 150° and set it on the counter, where the air temperature is 70°. After 10 minutes, the pie has cooled to 140°. How long will it take for the pie to cool to 100°?

2) Your 25 kg suitcase falls out of an airplane at an altitude of 10000 m and encounters an air resistance proportional to its velocity, with proportionality constant 25 kg/sec. Determine the equation of motion of the suitcase.

3) The town of Newton has 5000 inhabitants. Initially, there are 20 zombies among those 5000. After 5 days, there are 30 zombies. Assuming the zombie population grows logistically, how many zombies will there be after 100 days?

4) A 400 cubic meter tank is filled with water and 20 kg of salt is added and well mixed. Salt brine flows into the tank at the rate of 4 $m^3$ per minute with concentration 0.01 kg/$m^3$. The mixture is pumped out of the tank at the rate of 4 cubic meters per minute. Set up and solve the ODE for the mass of salt $S(t)$ in the tank.