

Problem	1	2	3	4	5	Grade
Points	/10	/10	/10	/10	/10	/ 50

Name: _____

Midterm Exam 1

Show all your work. Do not use a calculator or crib notes.

Problem 1 (10 pts) A tank originally contains 10 lb of salt dissolved in 200 gal of water. A brine with salt concentration 0.2 lb/gal of salt is pumped into the tank at the rate of 5 gal/min, while the well mixed solution is drained off at the rate of 3 gal/min. Find the weight of salt $A(t)$ in the tank at any time t before the tank overflows.

Problem 2 (10 pts) Solve the initial value problem. (Write the solution in an explicit form.)

$$y' + y^2 - 6y + 9 = 0, \quad t > 0, \quad y(0) = 4.$$

Problem 3 (10 pts) Find all solutions of the differential equation

$$e^t y' + \frac{e^{2t} y}{1 + e^t} - 2e^{3t} = 0.$$

Problem 4 (10 pts) Find the general solution of the differential equation

$$-2y'' + 4y' - 2y = 3e^t.$$

Problem 5 (10 pts) Solve the initial value problem

$$(1/4)y'' + 4y' + 25y = 0, \quad y(0) = 0, \quad y'(0) = -12.$$