Spring 2012 Midterm Exam

Print your name: _____ Section: F

This exam has 4 questions on 4 pages, worth a total of 40 points.

Problem	Points	Score
1	10	
2	10	
3	10	
4	10	
Total	40	

You should:

- write complete solutions or you may not receive credit
- box your final answer

You may:

- use up to 5 pages of notes and a non-graphing calculator
- write on the backs of the pages if you need more room

Please do not:

- share notes or calculators
- use a cell phone during the exam
- come to the front of the room to ask questions (Raise your hand)

Signature. Please sign below to indicate that you have not and will not give or receive any unauthorized assistance on this exam.

Signature: _____

1. (10 points) Solve the following initial value problem and determine the interval on which the solution is valid.

$$y' = y^2 (2x + 1) \qquad y(3) = -1/10$$

2. (10 points) Ten grams of salt is disolved in a 10 liter tank full of water. Then water containing salt at a concentration of 10 grams per liter trickles in at a rate of 2 liters per hour. The mixed solution flows out of the tank at a rate of 3 liters per hour.

   Determine the concentration (in grams per liter) of salt in the tank at the time when the tank contains 4 liters.

3. (10 points) One solution to the differential equation

$$6t^2y'' + 6ty' - 6y = 0$$

is $y_1 = t$. Use the reduction of order method to find the general solution to this linear homogeneous differential equation.

4. (10 points) A 0.5 kg mass stretches a spring by 25 centimeters. A damper with coefficient 6 N/(m/s) is also attached. The spring is pulled down another 25 centimeters and released. Determine the amount of time that elapses before the spring crosses the equilibrium for the first time. Use $g = 9.8$ m/s^2 for acceleration due to gravity.