

Name: \_\_\_\_\_ ID Number: \_\_\_\_\_

TA: \_\_\_\_\_ Section Time: \_\_\_\_\_

MTH 235  
Exam 1  
February 2, 2010  
50 minutes  
Sects: 2.1-2.4, 2.6

*No notes. No books. No Calculators.*  
*If any question is not clear, ask for clarification.*  
*No credit will be given for illegible solutions.*  
*If you present different answers for the same problem,*  
*the worst answer will be graded.*  
*Show all your work. Box your answers.*

- 1.** (15 points) Find the integrating factor that converts the equation below for the unknown  $y$  into an exact equation, where

$$4ty^3 y' + 3t^2 y' + 3ty + 4t^4 = 0.$$

You do not need to find the solution, only the integrating factor.

**2.** (17 points) Find all solutions  $y$  to the initial value problem

$$t^2 y' + 3t y = 5(t^2 + 1), \quad y(1) = 2, \quad t > 0.$$

- 3.** (17 points) A tank initially contains 90 liters of pure water. Water enters the tank at a rate of 3 liters per minute with a salt concentration of 2 grams per liter. The instantaneously mixed mixture leaves the tank at the same rate it enters the tank. Find the salt concentration in the tank at any time  $t \geq 0$ . Also find the limiting amount of salt in the tank in the limit  $t \rightarrow \infty$ .

4. (17 points) Find all solutions  $y$  to the equation

$$(t^2 + 2ty)y' = y^2.$$

**5.** (17 points) Find an explicit expression for all solutions  $y$  to the initial value problem

$$y' = \frac{9t^2 + y - 1}{4y - t}, \quad y(1) = 0.$$

**6.** (17 points) Find an explicit expression for all solutions  $y$  to the differential equation

$$t^2 y' = 2ty - y^3.$$

#	Pts	Score
1	17	
2	17	
3	17	
4	17	
5	17	
6	15	
$\Sigma$	100	