Homework Assignment 3 in Differential Equations, MATH308-FALL 2013

due September 9, 2013

Topics covered : *method of integrating factor (corresponds to sections 2.1) modeling with first order equation (section 2.3)..*

1. Find the general solution of the differential equation

$$t^2y' + 3ty = \cos 2t, \quad t > 0.$$

and determine how the solutions behave as $t \to +\infty$.

2. (a) Solve the initial value problem

$$y' + 8y = te^{-7t}, \quad y(0) = a \tag{1}$$

   (b) How do the solutions of (1) behave as t goes to $-\infty$? Show that this behavior depend on the choice of the initial value a and find the value a_0 for which the transition from one type of behavior to another occurs;

   (c) Describe the behavior of the solution of (1) as t goes to $-\infty$ corresponding to the initial condition $y(0) = a_0$, where a_0 is as in the previous item.

3. A tank originally contains 600 gal of fresh water. Then water containing 0.2 lb of salt per gallon is poured into the tank at a rate of 30 gal/min, and the mixture is allowed to leave at the same rate. After 30 min the process is stopped, and fresh water is poured into the tank at a rate of 15 gal/min, with the mixture again leaving at the same rate. Find the amount of salt in the tank at the end of an additional 20 min.