MATH 286 PROBLEMS DUE JANUARY 24, 2001

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1. Solve the differential equation

$$ty' + 2y = t\cos(t)$$

and describe the behaviour of the solution as $t \to \infty$.

2. Solve the differential equation

$$ty' - y = -t^2 e^{-t}$$

and draw its integral curves.

(Note: homework problem no. 2 was changed. In the original problem, the right hand side was te^{-t}, which led to an unsolvable integral.)

3. Solve the differential equation

$$y' = \frac{3x^2 - 2}{3 + 2y}$$

and draw its integral curves.

4. Solve:

$$y' = \frac{x}{y + x^2 y},\ y(0) = -2.$$

5. Consider a tank used in certain hydrodynamic experiments. After one experiment the tank contains 200 liters of a dye solution with a concentration of 1 g/liter. To prepare for the next experiment, the tank is to be rinsed with fresh water flowing in at a rate of 4 liters/min, the well-stirred solution flowing out at the same rate. Find the time that will elapse before the concentration of dye in the tank reaches 1% of its original value.