Elementary Differential Equations (MATH200) 1st Week Homework

Problem 1(2.1-3c). Find the general solution of the given differential equation, and use it to determine how solutions behave as $t \to \infty$.

$$y' + y = te^{-t} + 2$$

Problem 2(2.1-12). Find the solution of the given initial value problem.

$$ty' + 2y = 2\sin t, \ y(\pi/2) = 1, \ t > 0$$

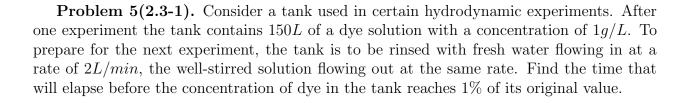
Problem 3(2.2-5). Solve the given differential equation.

$$\frac{dy}{dx} = \frac{3x - e^{-x}}{2y + e^y}$$

Problem 4(2.2-9). For given differential equation and initial condition

$$y' = (1 - 2x)y^2$$
, $y(0) = -1/12$

- a. Find the solution of the given initial value problem in explicit form.
- **b.** Plot the graph of the solution.
- **c.** Determine (at least approximately) the interval in which the solution is defined.



Problem 6(2.3-10). Newton's law of cooling states that the temperature of an object changes at a rate proportional to the difference between its temperature and that of its surroundings. Suppose that the temperature of a cup of coffee obeys Newton's law of cooling. If the coffee has a temperature of 90°C when freshly poured, and 1 min later has cooled to 85°C in a room at 20°C, determine when the coffee reaches a temperature of 65°C. \Box