

Due Thursday, Feb. 4 at the beginning of class.

1. For the differential equations $\frac{dy}{dt} = \frac{4y}{t}$
 - (a) Using MatLab, draw its direction field (print and attach your matlab file to the homework).
 - (b) Using MatLab, graph a few solutions to the equation.
2. Solve the equation/IVP.
 - (a) $(t + y + 1)dt - dy = 0$
 - (b) $(x^2 + 1)\frac{dy}{dx} + xy = x$
 - (c) $\frac{dy}{dx} - \frac{y}{x} = xe^x, \quad y(1) = e - 1$
 - (d) $t^3\frac{dx}{dt} + 3t^2x = t, \quad x(2) = 0$
 - (e) $\sin x\frac{dy}{dx} + y\cos x = x\sin x \quad y\left(\frac{\pi}{2}\right) = 2$
3. Suppose a brine containing 0.2 kg of salt per liter runs into a tank initially filled with 500 L of water containing 5 kg of salt. The brine enters the tank at a rate of 5 L/min. The mixture, kept uniform by stirring, is flowing out at a rate of 5 L/min. Find a concentration, in kilograms per liter, of salt in the tank after 10 min.
4. College graduate borrows \$10,000 to buy a car. The lender charges interest at an annual rate of 10%. Assuming that the interest is compounded continuously and that the borrower makes payment continuously at a constant annual rate k , determine the payment rate k that is required to pay off the loan in 5 years. Also determine how much interest is paid during the 5-year period.