Assignment Questions

ODE

1.	Solve the following ODE using pen and paper and plot the solution (in Matlab) for the range of x from 1 to 1.5 a. $(x^2 - y^2)dx + xydy = 0$ b. $dy + (2xy - x)dx = 0$ c. $(\cos x - \cos y - y)dx + x(\sin\ y - 1)\,dy = 0$ d. $(3e^x y + x)dx + e^x dy = 0; y(0) = 1$
2.	Try to solve the above equations and plot the function using the analytic solver dsolve. What do you observe?
3.	Now try to solve the following ODEs using dsolve. What do you observe? a. $dy + (xy - xy^3)dx = 0$ b. $dy + e^{-y^2}dx = 0$
4.	Now solve all the above ODEs (ode45) numerically and plot the solution for 1 to 1.5
5.	Implement Euler and RK methods to solve ODEs numerically and use these functions to plot the solution for the range x: 1 to 1.5
6.	What is radioactive decay? Formulate and solve the ordinary differential equation corresponding to radioactive decay? Write a Matlab program that takes the % of reduction is C^{14} in an animal fossil to predict the age of the fossil. Now write short notes on the following: 1. How will you assess the current quantity of C^{14} present in the fossil? 2. How will you assess the quantity of fossil available in the fossil when the animal has died?