Practice Problems

1. Given the equation $y' + 3x^2y = 6x^2$, determine whether either $y = x^2$ or $y = 2 + e^{-x^3}$ is a solution to the differential equation. Use MATLAB to create a plot of the solution if y(0) = 4.

2. Show that $y = \frac{1}{x+1}$ is a solution to the differential equation $y' + y^2 = 0$. Use MATLAB to create a plot of the solution if y(2) = $\frac{1}{5}$.

3. Create a plot for the solution to the differential equation $y' - \frac{y^2}{x^3} = 0$ if y(1) = 1.

4. Create a plot for the solution to the differential equation $(2y - 4)y' - 3x^2 = 4x - 4$, if y(1) = 3.

5. Create a plot for the solution to the differential equation $y' = e^{-y}(2x - 4)$ if y(5) = 0

6. Create a plot for the solution to the differential equation $ty' - 2y = t^5 \sin(2t) - t^3 + 4t^4$, if $y(\pi) = \frac{3}{2}\pi^4$

7. Create a plot for the solution to the differential equation $ty' + 2y = t^2 - t + 1$, if y(1) = 0.5

8. Create a plot for the solution to the differential equation $2xy^2 + 4 = 2(3 - x^2y)y'$ if y(5) = 8.

9. A 150 litre tank initially contains 60 litres of water with 0.5 kgs of salt dissolved in it. Water enters the tank at a rate of 0.9 litres/hr and the water entering the tank has a salt concentration of $\frac{1}{5}(1 + \cos(t))$ kgs/litre. If a well mixed solution leaves the tank at a rate of 0.6 litres/hr, how much salt is in the tank when it overflows?