

HOMEWORK 2  
DUE: THURSDAY, MAY 28

**1.** In each of the following problems determine if the equation is linear or non-linear and separable or non-separable and solve the IVP with the given initial conditions

a)  $y' + 2y = xe^{-x}$ ,  $y(0) = 2$

b)  $y' = \frac{3x^2}{3y^2 - 4}$ ,  $y(1) = 0$

c)  $2y' + xy = 2$ ,  $y(0) = y_0$  (Note: It is not possible to simplify  $\int e^{x^2}$ . You should leave the answer in terms of a proper integral involving this term.)

d)  $y' = \frac{x^2}{y(1+x^3)}$ ,  $y(0) = 1$

e)  $y' = \frac{x^2 + xy + y^2}{x^2}$ ,  $y(1) = 1$

f)  $y' = \frac{x^2 - 3y^2}{2xy}$ ,  $y(1) = 0$

**2.** Solve the two IVPs and determine their intervals of definition

a)  $\frac{dy}{dt} = y^2$ ,  $y(0) = 1$

b)  $y' - 2/3y = 1 - 1/2t$ ,  $y(0) = 0$

**3.** Solve the two IVPs and find the coordinates of the first local maximum point of each of the solutions for  $t > 0$ .

a)  $y' + 2/3y = 2 \cos t$ ,  $y(0) = 12/13$

b)  $y' = 2 \frac{\cos 2t}{(3 + 2y)}$ ,  $y(0) = -1$  (Hint: For finding the maxima, use the DE itself.

Do not differentiate the answer again.)