Math 286(2.4-2.5) Hw 3 Name & Box number:

1. Solve the given IVP and determine how the interval in which the solution exists depends on the initial value y_0. Please check that the below satisfies the hypotheses of Theorem 2-2.

(a) $y' + y^3 = 0, \quad y(0) = y_0$

(b) $y' = \dfrac{t^2}{y(1+t^3)}, \quad y(0) = y_0$

2. First solve explicitly for $x(t)$ in terms of t and the initial value $x_0 = x(0)$. Then sketch the several solution curves showing the nature of the trajectories for a wide variety of possible values of x_0 along with the phase line. Finally, determine the stability or instability of each critical point.

(a) $\dfrac{dx}{dt} = x - 2$ (b) $\dfrac{dx}{dt} = x + x^2$

For the problems 3 thru 7, solve the given differential equations or IVP.

3. $y' = \dfrac{x^2(1+x^3)}{y}$

4. $\dfrac{dy}{dx} = \dfrac{x - e^{-x}}{y + e^{y}}$

5. $xdx + ye^{-x}dy = 0, \quad y(0) = 1$

6. $y' = ty(4-y), \quad y(0) = 0.5$

7. $\dfrac{dy}{dx} = \dfrac{x^2 + 3y^2}{2xy}$