Math305 **Test I** **Name:**_____

Solve the following differential equations or initial value problems: (90')

1. $(4x^3y^2 - 6x^2y - 2x - 3)dx + (2x^4y - 2x^3)dy = 0 \qquad y(1) = 3$

2. $y' - x^2y^2 + 6y^2 + x^2 - 3xy^2 + 3x - 6 = 0 \qquad y(0) = 4$

3. $y' = 2x/(y + x^2 y)$ $\qquad\qquad$ $y(0) = -2.$

4. $ydx + \left(2x + \frac{2}{y^2} - 1\right)dy = 0$ $\qquad\qquad$ $y(2) = 3$

5. $ty' + 2y - t^2 + t - 1 = 0, \qquad y(1) = 1/2$

II. For the following equation, **determine** equilibrium points and **classify** each one as asymptotically stable, unstable or semistable. **Draw** the phase line and sketch several graphs of solutions in the ty-plane. (15')

$$dy/dt = 2y(y-3)(y-4)$$