MATH266: Midterm exam #1, October 4th, 2013

Name: _____

1. Solve the ODE
$$\frac{dy}{dx} = \frac{xy + y}{xy + x}\,.$$

2. For which value of p is the differential equation
$$2x + py + (2x + 3y)\frac{dy}{dx} = 0$$
exact? Using this value of p find the solution that satisfies $y(2) = 4$.

3. Solve
$$2y' - y = \frac{e^x}{y}$$

4. A can of soda takes one hour to cool from 30°C to 20°C in a refrigerator at 10°C. Find the object's temperature 30 minutes after it started to cool. ($\sqrt{2} \approx 1.4$)

5. Consider an autonomous ODE

$$\frac{dx}{dt} = x^2 - 6x + 5.$$

Find the equilibria and determine their stability. Plot the phase portrait. Using the phase portrait sketch several integral curves of the direction field defined by the equation.