MAP 2302 Elementary Ordinary Differential Equations

Homework Assignment # 3, Due January 27, 2016

1) Solve the initial-value problem

$$2x\cos y + 3x^2 y + (x^3 - x^2\sin y - y)y' = 0,\ \ y(0) = 2.$$

2) In the following equation, determine the constant A such that the resulting equation is exact and solve the resultant exact equation.

$$(x^2 + 3xy) + (Ax^2 + 4y)y' = 0.$$

3) Given the one-parameter family of curves determined by

$$x^3 - 3xy^2 + x + 1 = C,$$

compute the orthogonal family of curves.

4) Solve $(2x^2 + y) + (x^2 y - x)y' = 0$ with the initial condition $y(1) = 2$.

5) For each of the following differential equations, state the regions of the xy-plane in which the hypotheses of the fundamental existence and uniqueness theorem for first order ODE's are satisfied. In other words, determine the set of initial conditions (x_0, y_0) for which the existence and uniqueness theorem assures that there is a unique solution to the corresponding initial value problem.

a) $\cos y\, y' = x - e^{-x}\ y(x_0) = y_0$

b) $x^2 y' = (1 - y^2)^{1/2}\ y(x_0) = y_0$

Also from the text:

Section 2.4: Odd problems 1–37