MATH 205 **LAB 3** **Spring 2009**

Name: _____ Partners: _____

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INSTRUCTIONS:

1. Write the names of you and your partners.
2. Write all intermediate steps, and circle the answers.
3. Answers given without sufficient work to support them may NOT receive credit.
4. Every member of a group should turn in the lab report stapled with this paper on top.

1. Find the general solutions to the following DE's.

   (a) $\dfrac{y\cos x + 2x\tan y}{\sin x + x^2\sec^2 y} + y' = 0$

   (b) $x\,dy - y\,dx = 2x^2y^2\,dy$

   (c) $xy' = y + xe^{\frac{y}{x}}$

2. Solve the following IVP's.

   (a) $xy' + 3y - 3xy^{\frac{4}{3}} = 0\ , \quad y(-e) = \dfrac{1}{8e^3}$

   (b) $(x+y)y' = y\ , \quad y(2) = 1$

   (c) $y' = \sqrt{x+y}, \quad y(1) = 0$

3. Find the equation of the curve in the xy-plane through the point $(1, e)$, whose slope at the point (x, y) is $\dfrac{xy - 2y}{x^3}$.

4. Consider the following DE: $M(x,y)\,dx + N(x,y)\,dy = 0$.

   (a) Show that if $\dfrac{N_x - M_y}{xM - yN} = H(xy)$, where H is a function of one variable (i.e., $\frac{N_x - M_y}{xM - yN}$ depends only on xy), then the DE has an integrating factor of the form $\mu(x,y) = \rho(xy)$, where ρ is a function of one variable (i.e., $\mu(x,y)$ depends only on xy). Give the formula for $\rho(z)$.

   (b) Apply the method developed in (a) to solve the following DE:

$$\left(xy^2e^{xy} - x\right)dx + \left(x^2ye^{xy} + \frac{x^2}{y}\right)dy = 0$$