Quiz 2/**test prep 1** Name: ____________________

(front and back) (please print neatly!)

Directions: Answer each of the following **four** **(4)** questions, making sure to read the instructions for each question as you proceed.

You may use the backs of the pages for scratch work **or** get scrap paper from me!

1. (*10 pts*) Solve the IVP

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

SOLUTION:

2. (*10 pts*) Find a second-order linear homogeneous differential equation whose general solution is

$$y = c_1 e^{2t} + c_2 e^{-3t}.$$

SOLUTION:

3. (*10 pts*) For which of the following initial conditions does the IVP

$$(\ln(y) - 1)\frac{dy}{dx} - 2\sin x = \ln(\ln(x)), \quad y(x_0) = y_0$$

have a unique solution? **There may be more than one!**

i. $y(1) = 4$ ii. $y\left(\frac{\pi}{4}\right) = 0$ iii. $y\left(\frac{\pi}{2}\right) = 0$ iv. $y\left(\frac{\pi}{2}\right) = \frac{\pi}{2}$ v. $y(e) = e$ vi. None of These

4. (*1 pt ea.*) Consider the first-order IVP

$$\frac{dy}{dx} = f(x, y), \quad y(x_0) = y_0.$$

Indicate whether each of the following questions is True or False by writing the words "True" or "False" (and **not** just the letters "T" or "F"). **<u>No</u> justification is required!**

(a) The IVP always has a solution if f is continuous in a small rectangle containing x_0.

(b) The IVP always has a *unique* solution if f is continuous in a small rectangle containing x_0.

(c) The IVP always has a *unique* solution if $\frac{\partial f}{\partial y}$ is continuous in a small rectangle containing x_0.

(d) The IVP always has a solution if f and $\frac{\partial f}{\partial x}$ are both continuous in a small rectangle containing x_0.

(e) The IVP always has a *unique* solution if f and $\frac{\partial f}{\partial x}$ are both continuous in a small rectangle containing x_0.

(f) The IVP may have multiple solutions.

(g) The IVP may have no solution.

(h) <u>If</u> the IVP has a unique solution, the existence and uniqueness theorem tells you that the solution is valid on an x-interval containing x_0.

(i) <u>If</u> the IVP has a unique solution, the existence and uniqueness theorem helps you find the x-interval containing x_0 on which the solution is valid.

(j) If $f(x, y) = 0$, then the IVP has a unique solution.