Name:

This quiz covers: Chapter 2.6 and 2.7.   **DUE: Monday 2/27** at beginning of class.

Directions: Complete all questions and **show all applicable work.** Partial credit will be given. Please feel free to consult your text, notes and the online direction field solver as you see fit. Please do not discuss with other people (except the professor) or use the internet at large (including Wolfram Alpha). Each part is worth 5 points.

1.) (Chapter 2.6) Given the following differential equations, classify them as exact equations or not. If they are, give an implicit solution that satisfies the equation.

- $6x^2y^2 + 2y + (4x^3y + 2x)y' = 0$

- $3xy + 4 + (4xy - 4)y' = 0$

- $3 + 4x + (4y - 2)y' = 0$

2.) (Chapter 2.7) The differential equation $\frac{dy}{dx} - \ln(y)\sin(x+1) = 0$:

1. Plot a direction field using the directional field calculator from the course website. Use the window $-1 < x < 2$ and $-1 < y < 5$.

2. Given the initial condition $y(0) = 5$, plot a Euler Approximation with step size 1, 0.1, and 0.01.

3. Within the given region, how well does each approximate the perceived solution?

4. Change the region window to $-1 < x < 100$ and answer the prior two parts again.

5. What can be said about the quality of the approximation near the initial condition and faraway from the solution.

6. Find the point of equilibrium mathematically, and plot it. Is it a unique solution?

7. BONUS: On the same plot as the prior part, plot the solution starting at the point (4,0.1) with step size 1 and describe what property of the differential equation this solution is violating.