Name:

This quiz covers: Chapter 1 and 2. **DUE: 9:25 in my office or MAC 126**.

Directions: Complete all questions and **show all applicable work.** Partial credit will be given. You may use a calculator and one sheet of paper with handwritten notes. Please do not discuss with other people (except the professor) or use the Internet.

1.) A home buyer can afford to pay \$800 a month on a 15-year mortgage. Suppose that the interest rate is 9% and that interest is compounded **continuously** and payments are made **continuously**: (Note: this problem requires a differential equation, not a difference equation)

- Create a differential equation that models this problem. Be sure to define the meaning of variables.
- Determine the maximum amount that this buyer can afford to borrow.
- Determine the total interest paid during the term of the mortgage.

2.) A home buyer can afford to pay \$800 a month on a 15-year mortgage. Suppose that the interest rate is 9% and that interest is compounded **monthly** and payments are made **monthly**: (Note: this problem requires a difference equation, not a differential equation)

- Create a difference equation that models this problem. Be sure to define the meaning of variables.
- Determine the maximum amount that this buyer can afford to borrow.
- Determine the total interest paid during the term of the mortgage.

3.) Compare the two problems from above. Your answers should be similar in magnitude, but different. Is one more realistic? Are there assumptions being made that are inaccurate? Assuming you are the homeowner, which model should you base your budget? Why?

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4.) Solve the differential equation:

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

using the initial condition $y(0) = 4$.

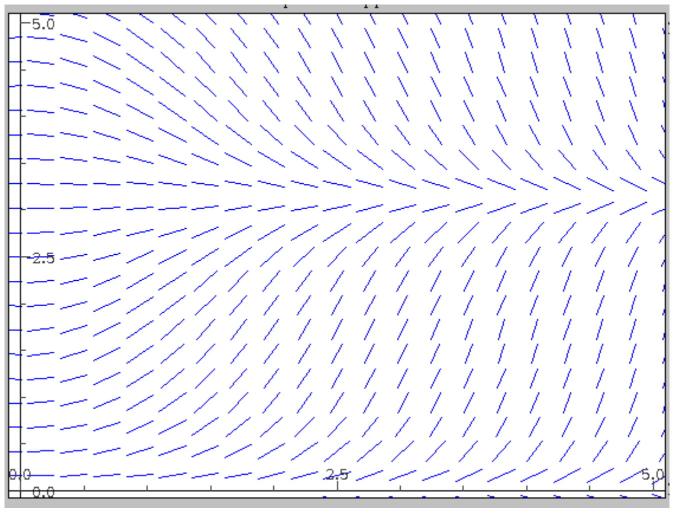
5.) Solve the differential equation:

$$2y' - y = e^{t/3}.$$

6.) Given the differential equation:

$$\frac{dy}{dx} = x\sin(y)$$

initial condition $y(0) = 1$, and direction field:



- Is the solution to the differential equation unique in a region near the initial condition? Why?
- Given the direction field, draw the solution of the IVP above.
- Find at least 2 equilibrium solutions (there are infinitely many!). Are they stable, semi-stable or unstable? why?