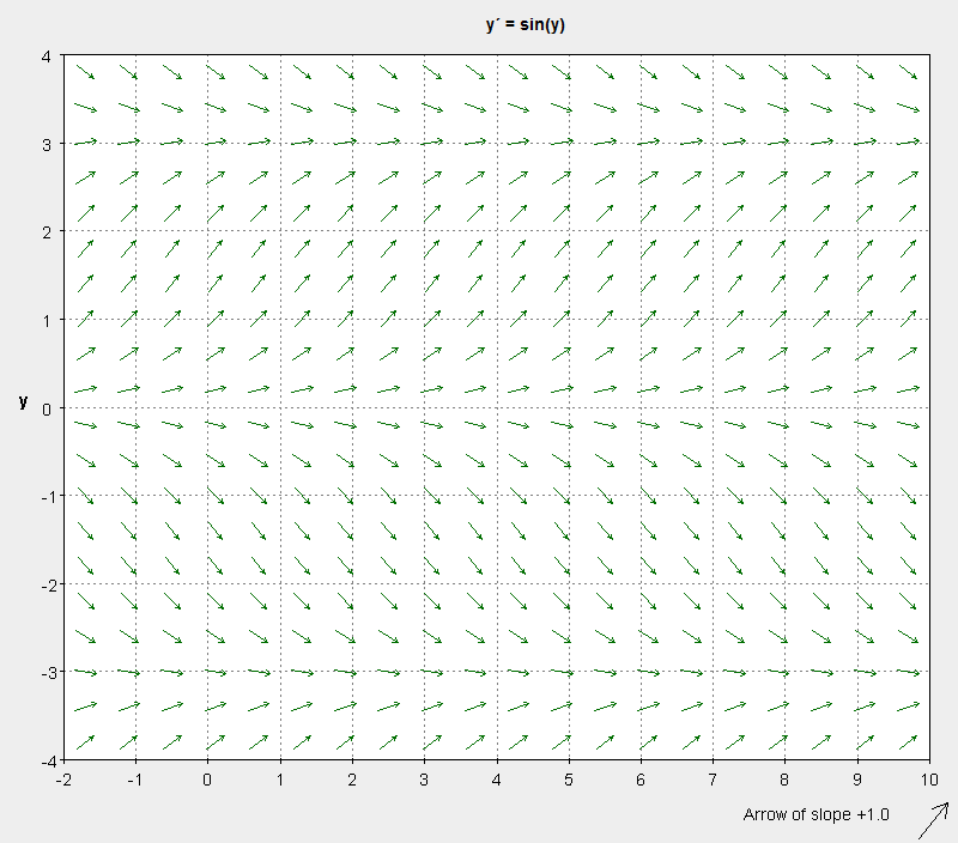
MAP 2302, Exam I Sample, Fall 2014

Name:_____

Student signature:_____

Write final answers on this sheet. Turn in all relevant work on separate sheets.

(1) The direction field for the ODE $\frac{dy}{dx} = \sin(y)$ is shown below.



Answer the following questions about the ODE and its direction field.

(a) What are all of the constant solutions of the ODE?

(b) Sketch the solution to the IVP with initial condition $y(0) = \pi/2$.

(c) Find a solution for the IVP with initial condition $y(0) = \pi/2$.

(2) Show that the equation $\frac{dy}{dx} = \frac{x+y}{x-y}$ is homogeneous. Solve the ODE using the substitution $v = \frac{y}{x}$.

(3) Find an integrating factor to make the following equation exact. Then find the most general solution for the equation.

$$(2y^2 + 2y + 4x^2)\,dx + (2xy + x)\,dy = 0$$

(4) Find the general solution to

$$\frac{dy}{dx} = x^2 e^{-4x} - 4y$$