

## MA 114 Worksheet #25: Differential equations & Direction fields

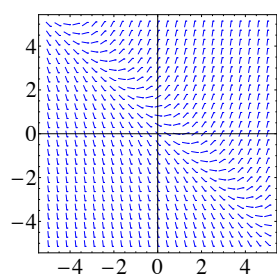
- Is  $y = \sin(3x) + 2e^{4x}$  a solution to the differential equation  $y'' + 9y = 50e^{4x}$ ? Explain why or why not.
  - Explain why every solution of  $dy/dx = y^2 + 6$  must be an increasing function.
  - What does it mean to say that a differential equation is linear or nonlinear.
- Find all values of  $\alpha$  so that  $y(x) = e^{\alpha x}$  is a solution of the differential equation  $y'' + y' - 12y = 0$ .
- Match the differential equation with its slope field. Give reasons for your answer.

$$y' = 2 - y \quad y' = x(2 - y) \quad y' = x + y - 1 \quad y' = \sin(x) \sin(y)$$

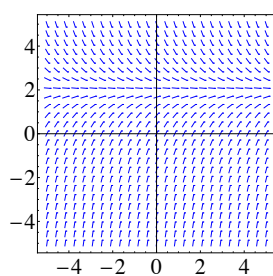
- Use slope field labeled IV to sketch the graphs of the solutions that satisfy the given initial conditions

$$y(0) = -1, \quad y(0) = 0, \quad y(0) = 1.$$

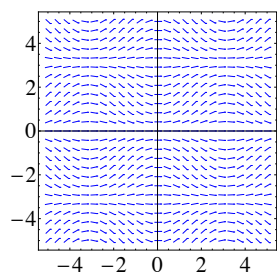
- Sketch the slope field of the differential equation. Then use it to sketch a solution curve that passes through the given point
  - $y' = y - 2x$ ,  $(1, 0)$
  - $y' = xy - x^2$ ,  $(0, 1)$



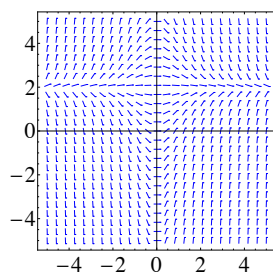
(a) Slope field I



(b) Slope field II



(c) Slope Field III



(d) Slope field IV

Figure 1: Slope fields for Problem 3