

## Math 24 Discussion Section

### Teaching Assistant

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### Warm Up

With your group, agree upon clear definitions for the following terms. If any are completely unfamiliar, make a note and move to the next term.

Direction or Slope Field

Integral or Solution Curve

Isocline

Differential Equation

Order of a Differential Equation

Ordinary Differential Equation (ODE)

Linear Differential Equation

Solution to a Differential Equation

General/Actual Solution to a Differential Equation

Implicit/Explicit Solution to a Differential Equation

Initial Value Problem (IVP)

Initial Condition

Interval of Validity

### Problems

1. Draw a direction field and plot (or sketch) several integral curves for the differential equation  $y' = y - x$ .
2. For the following differential equations, determine (a) the order and (b) whether they are linear.
  - i.  $ay'' + by' + cy = g(t)$
  - ii.  $\sin(y) \frac{d^2y}{dx^2} = (1-y) \frac{dy}{dx} + y^2 e^{-5y}$
  - iii.  $y^{(4)} + 10y''' - 4y' + 2y = \cos(t)$
3. Show that  $y(x) = x^{-\frac{3}{2}}$  is a solution to  $4x^2 y'' + 12xy' + 3y = 0$  for  $x > 0$ .
4. Show that  $y(x) = x^{-\frac{3}{2}}$  is a solution to  $4x^2 y'' + 12xy' + 3y = 0$ ,  $y(4) = \frac{1}{8}$ , and  $y'(4) = -\frac{3}{64}$ .
5. Solve the initial value problem  $\dot{x} = x^2$ ,  $x(0) = x_0$ , and show that the solution blows up in finite time for any  $x_0 > 0$ .