

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

Isocline

Differential Equation

Ordinary Differential Equation (ODE)

Solution to a Differential Equation

Implicit/Explicit Solution to a Differential Equation

Initial Condition

Interval of Validity

Integral or Solution Curve

Order of a Differential Equation

Linear Differential Equation

General/Actual Solution to a Differential Equation

Initial Value Problem (IVP)

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. $\sin(y) \frac{d^2 y}{dx^2} = (1 - y) \frac{dy}{dx} + y^2 e^{-5y}$
 - 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 $x_0 > 0$.