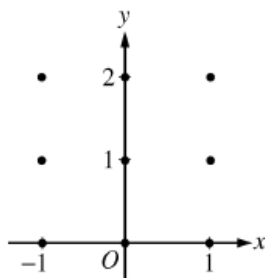


Differential Equations and Slope Fields Problem Set

Consider the differential equation $\frac{dy}{dx} = \frac{1}{2}x + y - 1$.

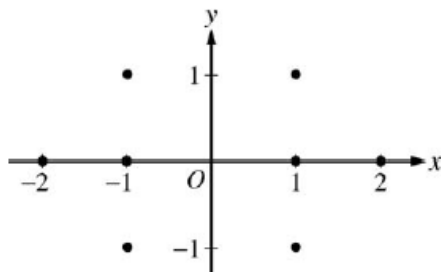
- (a) On the axes provided, sketch a slope field for the given differential equation at the nine points indicated.
(Note: Use the axes provided in the exam booklet.)



- (b) Find $\frac{d^2y}{dx^2}$ in terms of x and y . Describe the region in the xy -plane in which all solution curves to the differential equation are concave up.
- (c) Let $y = f(x)$ be a particular solution to the differential equation with the initial condition $f(0) = 1$. Does f have a relative minimum, a relative maximum, or neither at $x = 0$? Justify your answer.
- (d) Find the values of the constants m and b , for which $y = mx + b$ is a solution to the differential equation.

Consider the differential equation $\frac{dy}{dx} = \frac{1+y}{x}$, where $x \neq 0$.

- (a) On the axes provided, sketch a slope field for the given differential equation at the eight points indicated.
(Note: Use the axes provided in the pink exam booklet.)

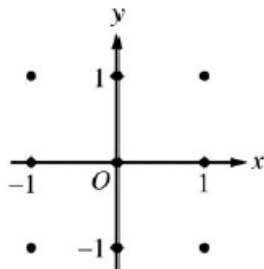


- (b) Find the particular solution $y = f(x)$ to the differential equation with the initial condition $f(-1) = 1$ and state its domain.

Consider the differential equation $\frac{dy}{dx} = (y - 1)^2 \cos(\pi x)$.

- (a) On the axes provided, sketch a slope field for the given differential equation at the nine points indicated.

(Note: Use the axes provided in the exam booklet.)



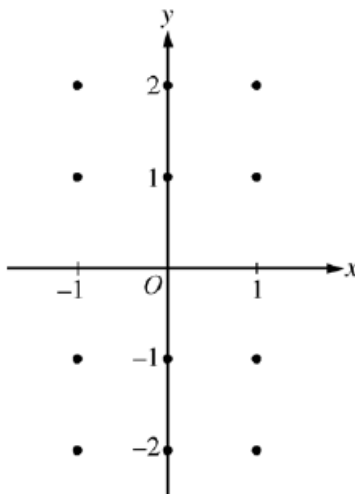
- (b) There is a horizontal line with equation $y = c$ that satisfies this differential equation. Find the value of c .

- (c) Find the particular solution $y = f(x)$ to the differential equation with the initial condition $f(1) = 0$.

Consider the differential equation $\frac{dy}{dx} = -\frac{2x}{y}$.

- (a) On the axes provided, sketch a slope field for the given differential equation at the twelve points indicated.

(Note: Use the axes provided in the pink test booklet.)



- (b) Let $y = f(x)$ be the particular solution to the differential equation with the initial condition $f(1) = -1$.

Write an equation for the line tangent to the graph of f at $(1, -1)$ and use it to approximate $f(1.1)$.

- (c) Find the particular solution $y = f(x)$ to the given differential equation with the initial condition $f(1) = -1$.