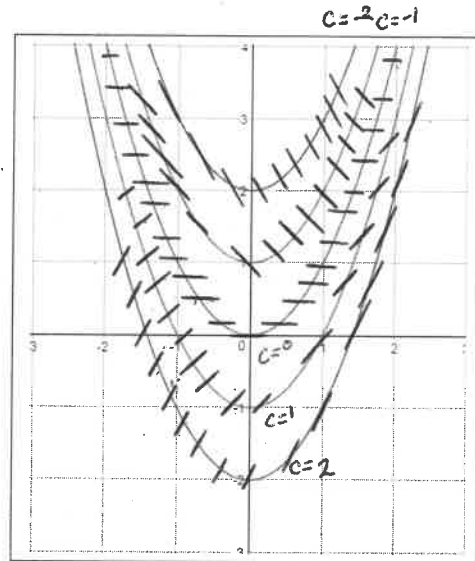


For full credit, you must show all work and circle your final answer.

- 1 Given the differential equation below, draw the isoclines for the given values and use them to sketch the slope field.

$$c = -2, -1, 0, 1, 2 \quad \frac{dy}{dx} = x^2 - y$$

$\frac{dy}{dx} = c$	isocline
$c = -2$	$y = x^2 + 2$
$c = -1$	$y = x^2 + 1$
$c = 0$	$y = x^2$
$c = 1$	$y = x^2 - 1$
$c = 2$	$y = x^2 - 2$



- 2 For the following differential equations give the order and classify as linear or non-linear

a) $x^2 \frac{dy}{dx} + 2y = 7x$ Linear 1st order

b) $\frac{1}{y} \frac{d^2y}{dx^2} + y = \sin(x)$ Non-linear 2nd order

- 3 Verify whether or not the following is a solution to the differential equation.

$$\varphi(x) = \sin(x) + x^2; \quad \frac{d^2y}{dx^2} + y = x^2 + 2$$

$$y = \varphi(x) = \sin(x) + x^2$$

$$y' = 2x + \cos(x)$$

$$y'' = 2 - \sin(x)$$

$$\underbrace{(2 - \sin(x))}_{y''} + \underbrace{(x^2 + \sin(x))}_{y} = x^2 + 2$$

$$\frac{d^2y}{dx^2} + y = x^2 + 2 \quad \checkmark$$