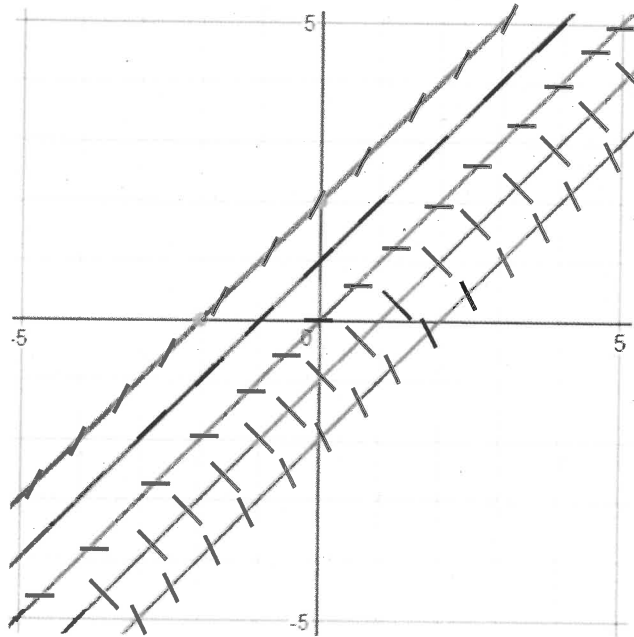


For full credit, you must show all work and circle your final answer.

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

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



c	
-2	$y = x - 2$
-1	$y = x - 1$
0	$y = x$
1	$y = x + 1$
2	$y = x + 2$

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

a)  $\frac{dp}{dt} = kp(c - p)$ , where  $c$  and  $k$  are constants. 1st order non-linear

b)  $8 \frac{d^4 y}{dx^4} = x(1 - x)$  4th order linear

- 3 Determine for which values of  $m$  the function  $\varphi(x) = x^m$  is a solution to the given equation.

$$x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} - 6y = 0, \quad (x > 0)$$

$$\varphi(x) = x^m$$

$$\varphi'(x) = m x^{m-1}$$

$$\varphi''(x) = m(m-1) x^{m-2}$$

$$x^2 (m(m-1) x^{m-2}) - x (m x^{m-1}) - 6 x^m$$

$$= x^m (m^2 - 2m - 6)$$

$$= 0$$

$$\text{when } m = 1 \pm \sqrt{7}$$