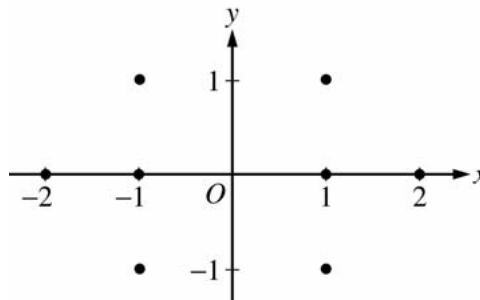


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**Question 5**

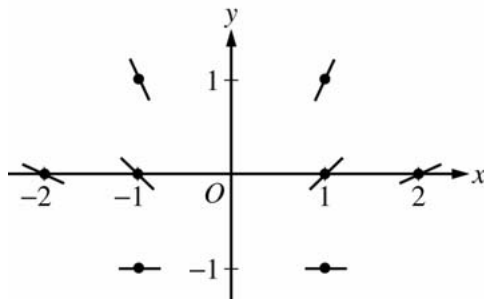
Consider the differential equation  $\frac{dy}{dx} = \frac{1+y}{x}$ , where  $x \neq 0$ .

- (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.

(a)



2 : sign of slope at each point and relative steepness of slope lines in rows and columns

(b)  $\frac{1}{1+y} dy = \frac{1}{x} dx$

$$\ln|1+y| = \ln|x| + K$$

$$|1+y| = e^{\ln|x|+K}$$

$$1+y = C|x|$$

$$2 = C$$

$$1+y = 2|x|$$

$$y = 2|x| - 1 \text{ and } x < 0$$

or

$$y = -2x - 1 \text{ and } x < 0$$

6 :  $\left\{ \begin{array}{l} 1 : \text{separates variables} \\ 2 : \text{antiderivatives} \\ 1 : \text{constant of integration} \\ 1 : \text{uses initial condition} \\ 1 : \text{solves for } y \end{array} \right.$

7 :  $\left\{ \begin{array}{l} \text{Note: max } 3/6 [1-2-0-0-0] \text{ if no} \\ \text{constant of integration} \\ \text{Note: } 0/6 \text{ if no separation of variables} \\ 1 : \text{domain} \end{array} \right.$