

1. Determine algebraically the shortest distance between  $(4, -3)$  and the line

$$y = -\frac{1}{3}x - 5. \text{ Express your answer in exact form, fully simplified.}$$

$$\text{slope} = -\frac{1}{3}$$

$$\perp \text{ slope} = 3$$

Shortest Distance Line

$$y = m(x - p) + q$$

$$y = 3(x - 4) - 3$$

$$y = 3x - 12 - 3$$

$$\underline{y = 3x - 15}$$

POI between both lines

$$3x - 15 = -\frac{1}{3}x - 5$$

$$3x + \frac{1}{3}x = -5 + 15$$

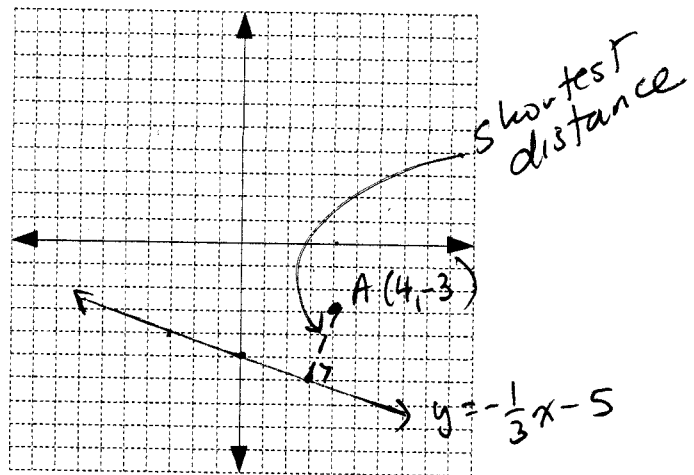
$$3\frac{1}{3}x = 10$$

$$\frac{10}{3}x = \frac{30}{3}$$

$$10x = 30$$

$$\therefore x = 3$$

$$\begin{aligned} \text{Sub... } y &= 3x - 15 \\ &= 3(3) - 15 \\ &= 9 - 15 \\ &= -6 \end{aligned}$$



The POI is  $(3, -6)$ .

pt. A is  $(4, -3)$ .

Distance between A and the line  
 $y = -\frac{1}{3}x - 5$ .

$$d = \sqrt{(3-4)^2 + (-6-(-3))^2}$$

$$= \sqrt{(-1)^2 + (-3)^2}$$

$$= \sqrt{1+9}$$

$$= \sqrt{10}$$

$\therefore$  The shortest distance to the line from Point A is  $\sqrt{10}$  units.