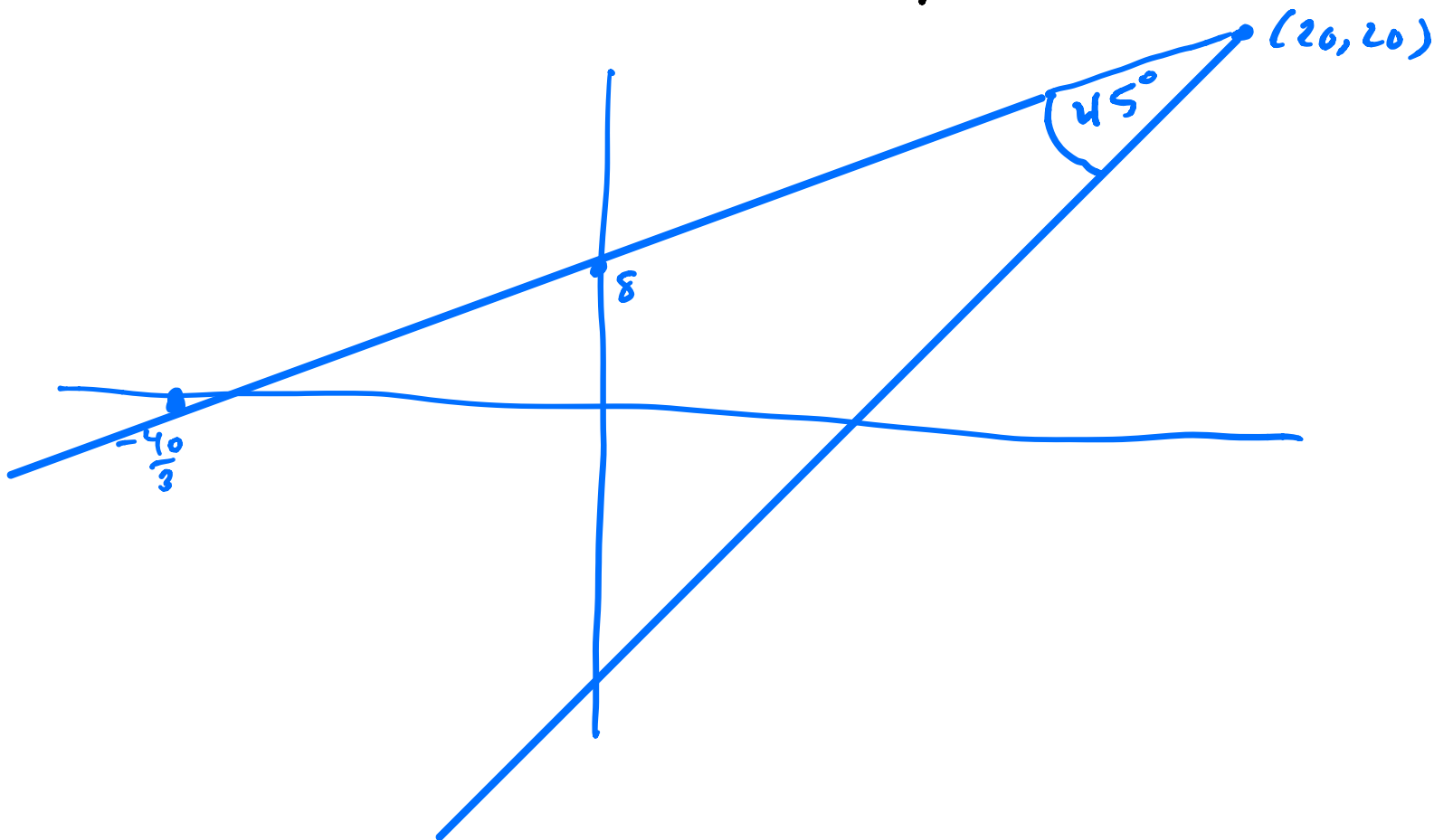


Line l in the coordinate plane has eqn

$$3x - 5y + 40 = 0$$

Rotate 45° counterclockwise about $(20, 20)$
to obtain line k .

What is x -coord of x -intercept of line k ?



Line l : $\underline{x\text{-int}}$ $y = 0 \Rightarrow -3x = 40$
 $\Rightarrow x = -\frac{40}{3}$

$\underline{y\text{-int}}$ $x = 0 \Rightarrow 5y = 40$
 $\Rightarrow y = 8$

Distance from line l to $(20, 20)$:

$$= \frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}}$$

$$= \frac{3(20) - 5(20) + 40}{\sqrt{3^2 + (-5)^2}}$$

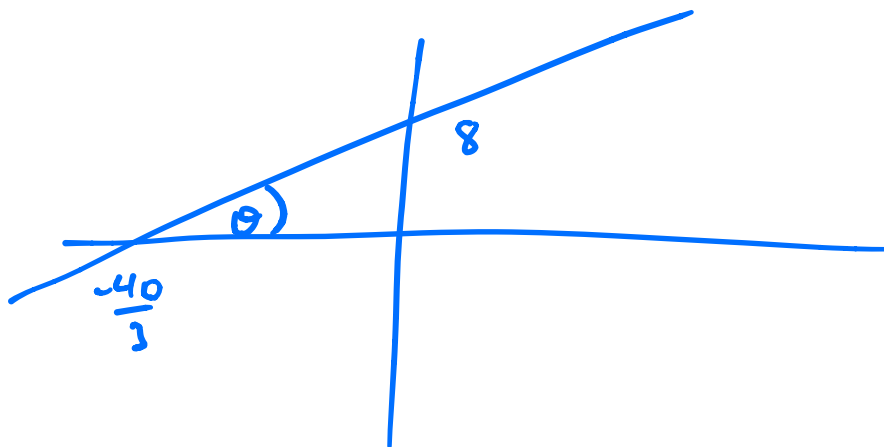
$$= \frac{60 - 100 + 40}{4}$$

$$= 0$$

didn't have to do this - could just sub point into eqn of line

So the point lies on the line

What is the angle that line l makes with the x -axis?



$$\tan(\theta) = \frac{8}{\left(\frac{40}{3}\right)}$$

$$= \frac{3}{5}$$

$$\text{So } \theta = \tan^{-1}\left(\frac{3}{5}\right)$$

And the angle that line k makes with the x -axis is $\theta + 45^\circ$.

Gradient of new line is

$$\tan(\theta + 45^\circ) = \frac{\tan(\theta) + \tan(45^\circ)}{1 + \tan(\theta)\tan(45^\circ)}$$

$$= \frac{\frac{3}{5} + 1}{1 - \frac{3}{5} \times 1}$$

$$= \frac{8/5}{2/5}$$

$$= 4$$

∴ equation of new line is

$$y - 20 = 4(x - 20)$$

x-int: $y = 0 \Rightarrow -20 = 4(x - 20)$

$$\Rightarrow -5 = x - 20$$

$$\Rightarrow x = 15$$

