

$$\textcircled{10} \quad 5x^2 - 4x + 23 = 0$$

$$\Rightarrow x^2 - \frac{4}{5}x + \left(\frac{2}{5}\right)^2 = -\frac{23}{5} + \frac{4}{25}$$

$\left( \begin{array}{l} \text{Always} \\ \text{add} \\ \text{Scratch} \end{array} \right)$

$$\left( \begin{array}{l} \frac{5x^2}{5} \cdot \frac{1}{5} = \frac{5x^2}{25} \\ -\frac{4}{5} \cdot \frac{1}{5} = -\frac{4}{25} \\ +\frac{4}{25} \end{array} \right)$$

$$= \frac{-115 + 4}{25} = -\frac{111}{25}$$

$$\Rightarrow \left(x - \frac{2}{5}\right)^2 = -\frac{111}{25}$$

Optional

$$\sqrt{\left(x - \frac{2}{5}\right)^2} = \sqrt{-\frac{111}{25}}$$

$$\left|x - \frac{2}{5}\right| = i \frac{\sqrt{111}}{5}$$

$$\Rightarrow x - \frac{2}{5} = \pm \frac{\sqrt{111}}{5} i$$

$$\Rightarrow \boxed{x = \frac{2 \pm \sqrt{111} i}{5}} \quad \text{OK}$$

$$\Rightarrow x \in \left\{ \frac{2 \pm \sqrt{111} i}{5} \right\} \quad \text{STYLIN'}$$

$$\textcircled{4} \quad dx^2 + 3wx - 8\pi = 0$$

$$a = d, \quad b = 3w, \quad c = -8\pi$$

$$\begin{aligned} \Rightarrow b^2 - 4ac &= (3w)^2 - 4(d)(-8\pi) \\ &= 9w^2 + 32\pi d \end{aligned}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-3w \pm \sqrt{9w^2 + 32\pi d}}{2d}$$

Can I pull the  $9w^2$  out? Sure, but you'll leave a toxic waste dump behind.

$$\begin{aligned} \sqrt{9w^2 + 32\pi d} &= \sqrt{9w^2 \left(1 + \frac{32\pi d}{9w^2}\right)} \\ &= 3w \sqrt{1 + \frac{32\pi d}{9w^2}} \end{aligned}$$

$$\sqrt{25} = 5 \neq 7$$

$$\sqrt{25} = \sqrt{9+16} = \sqrt{3^2+4^2} =$$

$$\textcircled{3+4} = 7, \text{ Devon's way.}$$

$$\text{No! } \sqrt{A+B} \neq \sqrt{A} + \sqrt{B}$$

12. Find an equation in point-slope form through the point  $(-13, 77)$  of the line that is...

a. (5 pts) ... parallel to  $y = -5x + 13$

b. (5 pts) ... perpendicular to  $y = -5x + 13$

$$m_{\parallel} = m$$

$$m_{\perp} = -\frac{1}{m}$$

"negative reciprocal"

STOP!

a)  $y = m(x - x_1) + y_1$   
 $y = -5(x - (-13)) + 77$

$$y = -5(x + 13) + 77$$

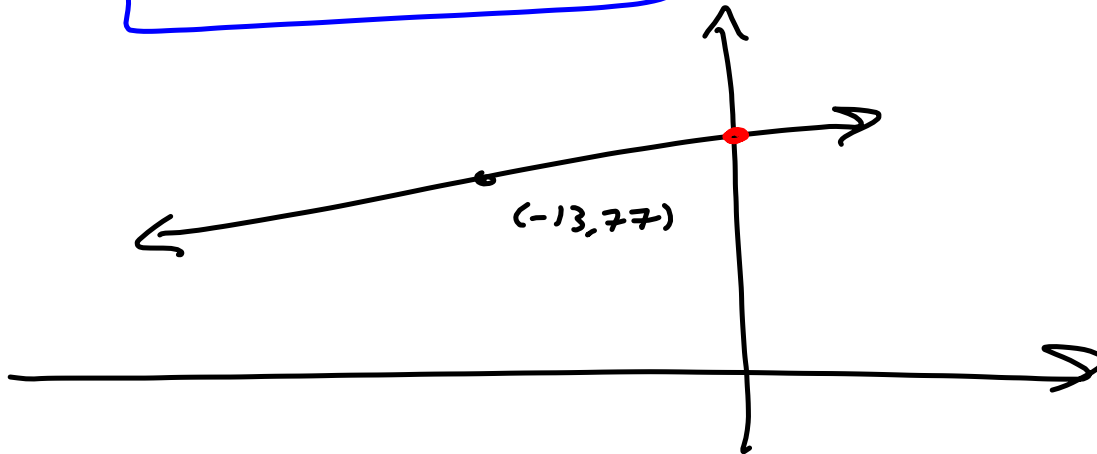
I asked for slope-intercept

$$= -5x - 65 + 77$$

$$y = -5x + 12$$

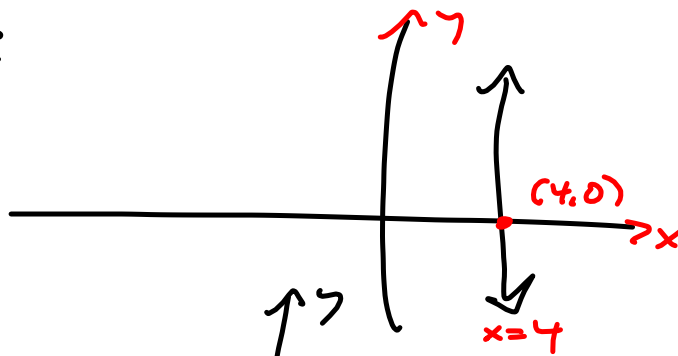
$$m_{\perp} = -\frac{1}{m} = -\frac{1}{-5} = \frac{1}{5}$$

b)  $y = \frac{1}{5}(x + 13) + 77$

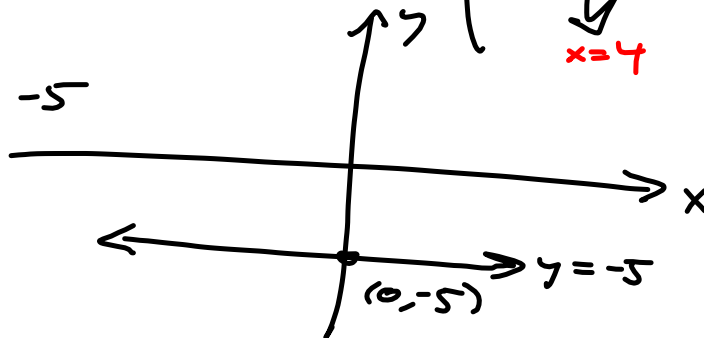


13 Sketch

a  $x = 4$



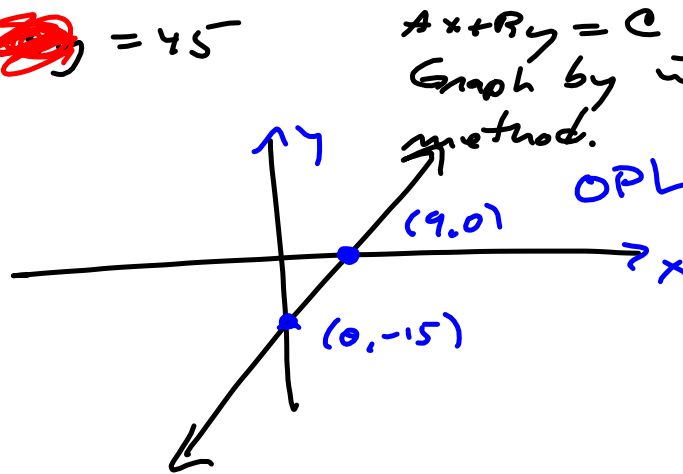
b  $y = -5$



14  $5x = 45$

x	y
0	-15
9	0

0	-52
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OPL: ORDERED-PAIR LABELS

Graph

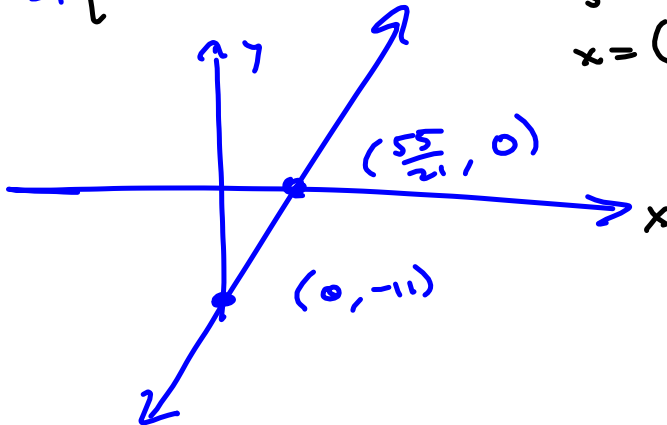
$$y = \frac{21}{5}x - 11$$

x	y
0	-11
$\frac{55}{21}$	0

$$y = 0 \rightarrow \frac{21}{5}x - 11 = 0$$

$$\frac{21}{5}x = 11$$

$$x = (11) \left( \frac{5}{21} \right) = \frac{55}{21}$$



$$|3x-7| < -5 \quad \text{Never!} \quad \emptyset$$

$$|3x-7| > -5 \quad \text{Always!} \quad \mathbb{R} = (-\infty, \infty)$$

By inspection

$$|3x-7| < -5$$

$$3x-7 < -5 \quad \text{AND} \quad 3x-7 > 5$$

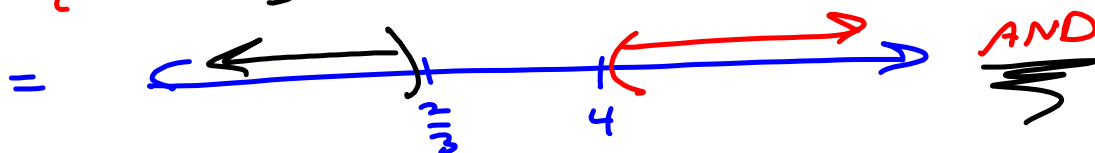
$$3x < 2$$

$$3x > 12$$

$$\{x \mid x < \frac{2}{3}\}$$

AND

$$\{x > 4\}$$



$$= (-\infty, \frac{2}{3}) \cap (4, \infty)$$

$$= \emptyset$$

↖ AND = Intersct.

$$|3x-7| > -5$$



$$3x-7 > -5$$

OR

$$3x-7 < 5$$

$$3x > 2$$

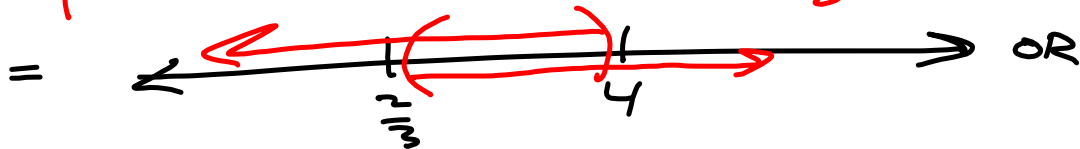
$$3x < 12$$

 $\{x$ 

$$x > \frac{2}{3}$$

OR

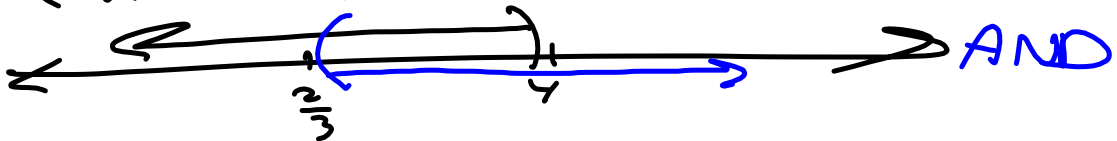
$$x < 4$$



$$= \left(\frac{2}{3}, \infty\right) \cup (-\infty, 4) = (-\infty, \infty)$$

What about

$$\left(\frac{2}{3}, \infty\right) \cap (-\infty, 4)?$$



$$= \left(\frac{2}{3}, 4\right)$$

(17)

Spring '18 Test 1

17. (5 pts) SET UP THE FOLLOWING WORD PROBLEM. Do not solve.

John can mow Middlebrook Cemetery in 11 hours. Tracy can mow it in 15 hours. How long does it take them to mow the cemetery, if they work together?

Let  $x$  = the amt of time  
it takes them to  
mow the cemetery,  
working together (hours)

John: 11 hrs

Tracy: 15 hrs

Let  $x$  = time John works (in hours)  
= .. Tracy .. - ..

$$\frac{1}{11}x + \frac{1}{15}x = 1$$

Stop! Setup only.

$$\left(\frac{1}{11} \frac{\text{Job}}{\text{hr}}\right)(x \text{ hrs}) = \frac{1}{11}x \text{ Job}$$



2. (5 pts) Suppose Tracy shows up 3 hours late to work, then joins John, and they finish working together. How many hours does each of them end up working?

Let  $x =$  the amt of time John works ( $\approx$  hrs)

$$y = \dots \dots \dots \text{Tracy} \dots \dots \dots$$

$$= x - 3$$

$$\text{LCD} = 11 \cdot 15$$

$$\frac{1}{11}x + \frac{1}{15}(x-3) = 1$$

$$\frac{x}{11} \cdot \frac{15}{15} + \frac{x-3}{15} \cdot \frac{11}{11} = \frac{11 \cdot 15}{11 \cdot 15}$$

$$\frac{15x + 11(x-3)}{\text{LCD}} = \frac{165}{\text{LCD}}$$

$$15x + 11x - 33 = 165$$

$$26x = 198$$

$$x = \frac{198}{26} = \boxed{\frac{99}{13}} = x \approx 7.615384615 \text{ hrs}$$

$$\Rightarrow y = x - 3 = \frac{99}{13} - 3 = \frac{99 - 39}{13} = \boxed{\frac{60}{13}} = y$$

$$\approx 4.615384615$$

$\boxed{S' 1.5}$

$$x^2 - 4x - 20 = 0$$

$$x^2 - 4x + 2^2 = 20 + 4$$

$$(x-2)^2 = 24$$

$$x-2 = \pm \sqrt{24} = \pm 2\sqrt{6}$$

$$x = 2 \pm 2\sqrt{6}$$

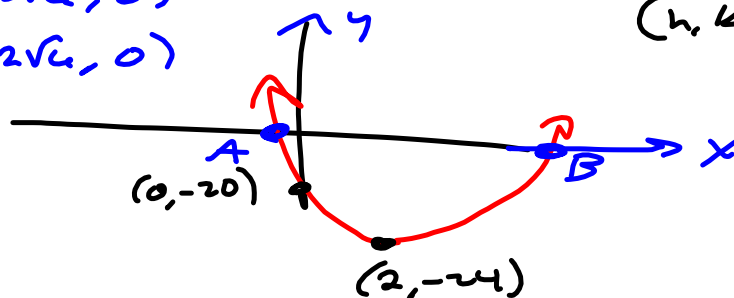
$$S' 7.1 \quad x^2 - 4x - 20 = x^2 - 4x + 2^2 - 4 - 20$$

$$= (x-2)^2 - 24 = 2(x-h)^2 + k$$

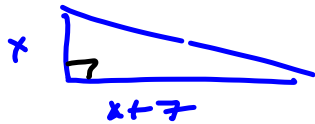
$(h, k) = \text{vertex.}$

$$A = (2 - 2\sqrt{6}, 0)$$

$$B = (2 + 2\sqrt{6}, 0)$$



$P = 30$



$$\begin{aligned} & \sqrt{x^2 + (x+7)^2} \\ &= \sqrt{x^2 + x^2 + 14x + 49} \\ &= \sqrt{2x^2 + 14x + 49} \end{aligned}$$

$$x + x + 7 + \sqrt{2x^2 + 14x + 49} = 30$$

$$2x - 23 = -\sqrt{2x^2 + 14x + 49}$$

$$-2x + 23 = \sqrt{2x^2 + 14x + 49}$$

$$(-2x + 23)^2 = (2x - 23)^2 = 2x^2 + 14x + 49$$

$$(2x)^2 - 2(2x)(23) + 23^2 = 2x^2 + 14x + 49$$

$$4x^2 - 92x + 529 = 2x^2 + 14x + 49$$

$$2x^2 - 106x + 480$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$