

Spring, 2019

① 10 pts

$$3x - 2 = 5x + 7$$

$$-2x = 9$$

$$x = -\frac{9}{2}$$

$$\text{or } x \in \left\{ -\frac{9}{2} \right\}$$

② 5 pts

$$\frac{1}{6}x + \frac{7}{4} = \frac{4}{15}x - \frac{2}{3} \quad \frac{26}{3} \quad \frac{24}{2} \quad \frac{315}{5}$$

$$\text{LCD} = \frac{2 \cdot 2 \cdot 3 \cdot 5}{1} = 60 = \text{LCD}$$

$$\Rightarrow \frac{x}{6} \cdot \frac{10}{10} + \frac{7}{4} \cdot \frac{15}{15} =$$

$$\frac{4x}{15} \cdot \frac{4}{4} - \frac{2}{3} \cdot \frac{20}{20}$$

$$\Rightarrow \frac{10x + 105}{\text{LCD}} = \frac{16x - 40}{\text{LCD}}$$

$$\Rightarrow 10x + 105 = 16x - 40$$

$$-6x = -145$$

$$x = \frac{145}{6}$$

$$\text{or } x \in \left\{ \frac{145}{6} \right\}$$

③ 5 pts

$$11x^2 = 9$$

$$x^2 = \frac{9}{11}$$

$$x = \pm \sqrt{\frac{9}{11}}$$

$$= \pm \frac{3}{\sqrt{11}} = \pm \frac{3\sqrt{11}}{\sqrt{11}\sqrt{11}}$$

$$= \left\{ \pm \frac{3\sqrt{11}}{11} = x \right\} \text{ or } x \in \left\{ \pm \frac{3\sqrt{11}}{11} \right\}$$

(4) (5 pts) $5x^2 - 3x + 6 = 0$

$$a = 5, b = -3, c = 6$$

$$b^2 - 4ac = (-3)^2 - 4(5)(6)$$

$$= 9 - 120$$

$$= -111 \rightsquigarrow i\sqrt{111}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{3 \pm i\sqrt{111}}{2(5)} = \frac{3 \pm i\sqrt{111}}{10} = x$$

$$\text{or } x \in \left\{ \frac{3 \pm i\sqrt{111}}{10} \right\}$$

(5) (5 pts) $11x^2 = 9 \rightarrow 11x^2 + 0x - 9 = 0$

$$\rightarrow a = 11, b = 0, c = -9 \rightarrow$$

$$b^2 - 4ac = -4(11)(-9) = 396 > 0$$

$$\begin{array}{r} 2 \overline{) 396} \\ 2 \overline{) 198} \\ 3 \overline{) 99} \\ 3 \overline{) 33} \\ 11 \end{array}$$

Not Perfect square \rightarrow
 2 real, irrational zeros

(6) (5 pts) $5x^2 - 3x + 6 = 0 \Rightarrow$

$$a = 5, b = -3, c = 6 \Rightarrow$$

$$b^2 - 4ac = (-3)^2 - 4(5)(6)$$

$$= 9 - 120 = -111 \Rightarrow$$

2 nonreal solms (distinct)

(7) (5 pts) $84x^2 - 37x - 30 = 0$

$$\Rightarrow a = 84, b = -37, c = -30$$

$$\Rightarrow b^2 - 4ac = (-37)^2 - 4(84)(-30)$$

$$= 1369 + 10080$$

$$b^2 - 4ac = 11449$$

$$\sqrt{11449} = 107 \Rightarrow \text{Perfect square}$$

2 distinct, RATIONAL zeros.

$$\begin{array}{r} 37 \\ 37 \\ \hline 259 \\ 111 \\ \hline 1369 \end{array}$$

$$\begin{array}{r} 120 \\ 84 \\ \hline 480 \\ 9600 \\ \hline 10080 \\ + 1369 \\ \hline 11449 \end{array}$$

121

T1

8 (10pts) $x^2 + 3x - 180$

$$= x^2 + 15x - 12x - 180$$

$$= x(x+15) - 12(x+15)$$

$$= (x+15)(x-12) = 0$$

$$\Rightarrow x = -15, 12 \quad \text{or} \quad x \in \{-15, 12\} \quad \text{3 better style.}$$

$$\begin{array}{r} 2 \overline{) 80} \\ 2 \overline{) 40} \\ 3 \overline{) 45} \\ 3 \overline{) 15} \\ 15 \overline{) 5} \end{array}$$

Want a difference
of "3" for
the "3x"

9 (5pts) $84x^2 - 37x - 30$

$$= 84x^2 - 72x + 35x - 30$$

$$= 12x(7x-6) + 5(7x-6)$$

$$= (7x-6)(12x+5) = 0$$

$$\Rightarrow x = -\frac{5}{12}, \frac{6}{7} \quad \text{OR}$$

$$x \in \left\{ -\frac{5}{12}, \frac{6}{7} \right\}$$

OLD
SCHOOL

$$\begin{array}{r} 184 \\ 30 \\ \hline -2520 = 20 \\ = \text{MAGIC} \end{array}$$

$$\begin{aligned} -37 &= -42 + 5 && -210 \\ &= -52 + 15 && -780 \\ &= -62 + 25 && -1550 \\ &= -72 + 35 && -2520! \end{aligned}$$

SLEGGE HAMMER: Quadratic formula gives

you $x = -\frac{5}{12}, \frac{6}{7}$. So $84(x + \frac{5}{12})(x - \frac{6}{7})$

$$= 12 \cdot 7 (x + \frac{5}{12})(x - \frac{6}{7}) = 12(x + \frac{5}{12})(7)(x - \frac{6}{7})$$

$$= (12x + 5)(7x - 6) = \text{FACTORED!}$$

121 T1

10 5 pts

$$x^2 = 6x - 11$$

$$= x^2 - 6x + 3^2 - 9 - 11$$

$$= (x-3)^2 - 20 \stackrel{\text{SET } 0}{=}$$

$$\Rightarrow (x-3)^2 = 20$$

$$\begin{array}{r} 2 \overline{)20} \\ 2 \overline{)10} \\ \underline{5} \end{array}$$

$$x-3 = \pm \sqrt{20} = \pm 2\sqrt{5}$$

$$\boxed{x = 3 \pm 2\sqrt{5}}$$

$$\text{OR } x \in \{3 \pm 2\sqrt{5}\}$$

11 $3x^2 + 5x - 10$

$$= 3\left(x^2 + \frac{5}{3}x\right) - 10$$

$$= 3\left(x^2 + \frac{5}{3}x + \left(\frac{5}{6}\right)^2\right) - 10 - 3\left(\frac{25}{36}\right)$$

$$-10 - \frac{25}{12} = \frac{-120-25}{12}$$

$$= \frac{-145}{12}$$

$$= 3\left(x + \frac{5}{6}\right)^2 - \frac{145}{12} \stackrel{\text{SET } 0}{=}$$

$$\begin{array}{r} 5 \overline{)145} \\ \underline{29} \end{array}$$

$$\begin{array}{r} 36 \\ = 6^2 \end{array}$$

$$\Rightarrow 3\left(x + \frac{5}{6}\right)^2 = \frac{145}{12}$$

$$\left(x + \frac{5}{6}\right)^2 = \frac{145}{36}$$

$$x + \frac{5}{6} = \pm \sqrt{\frac{145}{36}} = \pm \frac{\sqrt{145}}{6}$$

$$\Rightarrow \boxed{x = \frac{-5 \pm \sqrt{145}}{6}}$$

$$\text{OR } x \in \left\{ \frac{-5 \pm \sqrt{145}}{6} \right\}$$

121

+ 1

12a

5pts

$$m = \frac{5}{7} = m_{11}, (x_1, y_1) = (3, -5)$$

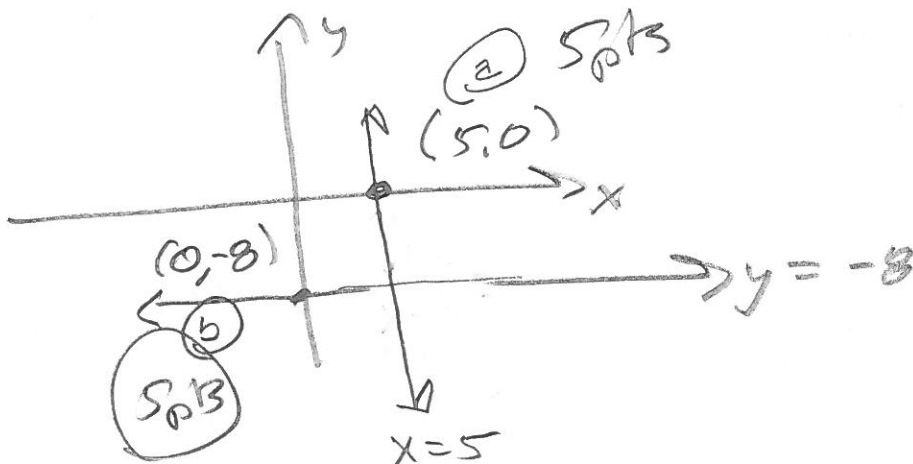
$\rightarrow y = \frac{5}{7}(x-3) - 5$ STOP! This is point-slope form!
 (or $y+5 = \frac{5}{7}(x-3)$)
 $= \frac{5}{7}x - \frac{15}{7} - 5$
 $= \frac{5}{7}x - \frac{15}{7} - \frac{35}{7}$ if you ignore my teachings!
 $= \frac{5}{7}x - \frac{52}{7}$

12b

$$m = \frac{5}{7} = -\frac{1}{m_{\perp}} \Rightarrow m_{\perp} = -\frac{7}{5}$$

$y = -\frac{7}{5}(x-3) - 5$ STOP!
 $= -\frac{7}{5}x + \frac{21}{5} - \frac{25}{5} = -\frac{7}{5}x - \frac{4}{5}$

13

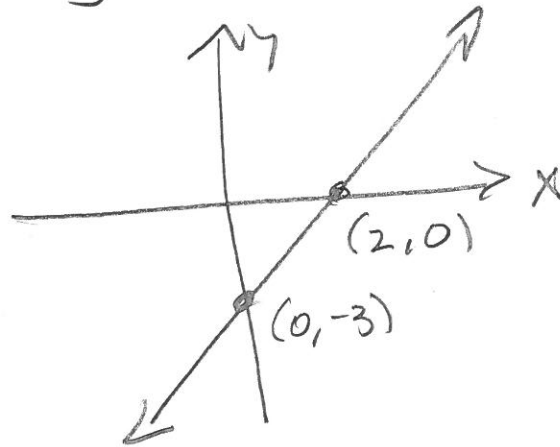


121 ~~1~~

(14) (5pts)

$$3x - 2y = 6$$

x	y
0	-3
2	0



(15) (10pts)

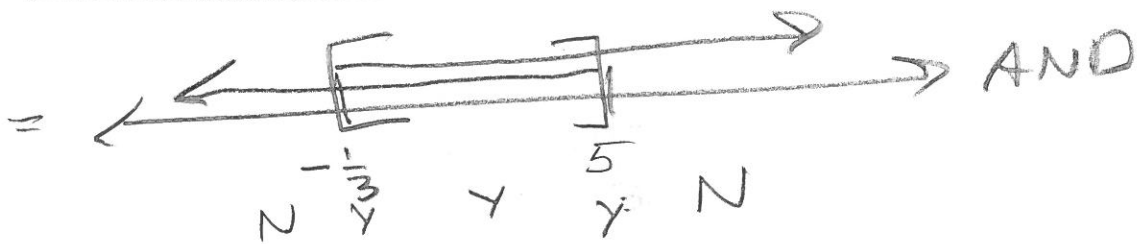
$$|3x - 7| \leq 8 \rightarrow$$

$$3x - 7 \leq 8 \text{ AND } 3x - 7 \geq -8$$

$$3x \leq 15$$

$$3x \geq -1$$

$$\left\{ x \mid x \leq \frac{15}{3} = 5 \text{ AND } x \geq -\frac{1}{3} \right\}$$



$$= \left[-\frac{1}{3}, 5 \right]$$

121

T 1

(15b)

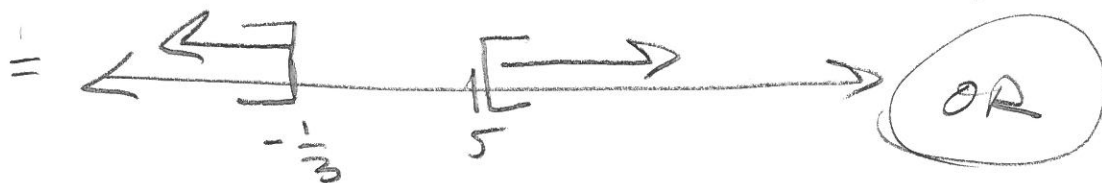
(5pts)

$$|3x - 7| \geq 8$$

$$3x - 7 \geq 8 \quad \text{OR} \quad 3x - 7 \leq -8$$

$$3x \geq 15 \quad \text{OR} \quad 3x \leq -1$$

$$\left\{ x \mid x \geq 5 \quad \text{OR} \quad x \leq -\frac{1}{3} \right\}$$



$$= (-\infty, -\frac{1}{3}] \cup [5, \infty)$$

(15c)

(5pts)

$$|7x + 3| + 7 > 6$$

$$|7x + 3| > -1$$

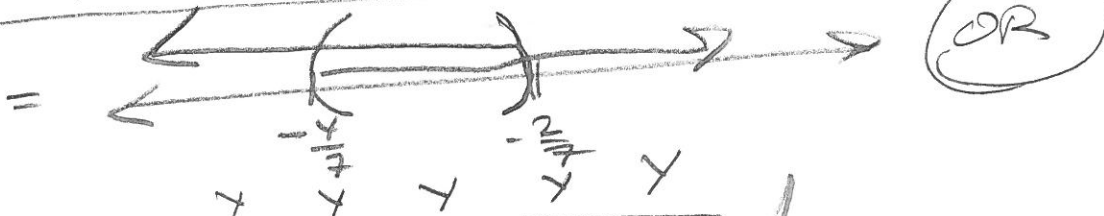
ALWAYS
 $(-\infty, \infty)$

$$7x + 3 > -1 \quad \text{OR} \quad 7x + 3 < 1$$

$$7x > -4$$

$$7x < -2$$

$$\left\{ x \mid x > -\frac{4}{7} \quad \text{OR} \quad x < -\frac{2}{7} \right\}$$



$$= (-\infty, \infty)!$$

121 T 1

15d

$$|7x+3| - 7 < 6$$

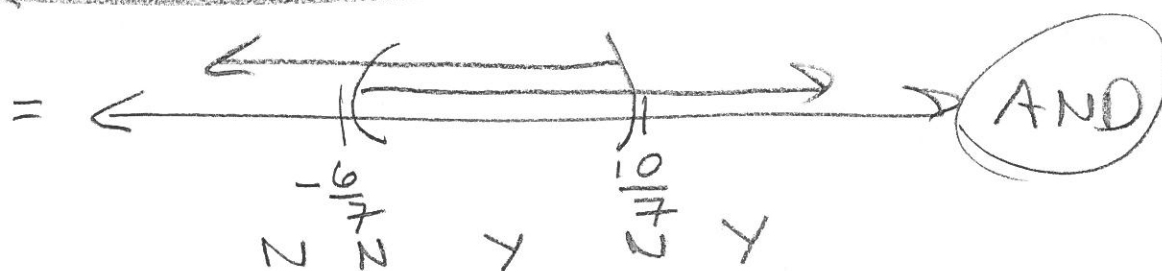
$$|7x+3| < 13$$

$$7x+3 < 13 \quad \text{AND} \quad 7x+3 > -3$$

$$7x < 10$$

$$7x > -6$$

$$\left\{ x \mid x < \frac{10}{7} \quad \text{AND} \quad x > -\frac{6}{7} \right\}$$



$$= \left(-\frac{6}{7}, \frac{10}{7} \right)$$

16

Spts

Let x = the amount of 30% alcohol solution (liters)

$$\text{Amt Alcohol} = \text{Amt Alcohol}$$

$$.3x + .83(100) = .5(x+100)$$

30

17

5 pts

Let x = the amount of time it takes them to finish job, together (hours)

Then $\frac{1}{10}x + \frac{1}{12}x = 1$ JOB DONE

B 1

5 pts

$$\frac{1}{10}x + \frac{1}{12}x = 1$$

$$\text{LCD} = 2 \cdot 6 \cdot 5 = 60$$

$$\begin{array}{r} 5 \cancel{10} \\ 2 \\ 4 \cancel{12} \\ 2 \end{array}$$

$$\frac{x}{10} \cdot \frac{6}{6} + \frac{1}{12} \cdot \frac{5}{5} = \frac{1}{1} \cdot \frac{60}{60}$$

$$6x + 5 = 60$$

$$6x = 55$$

$$x = \frac{55}{6} \text{ hrs to do the job}$$

$$= 9.1\bar{6} \text{ hrs}$$

B 2

Let x = the time John spends on job
= hours

Then $y = x + 2$ = the time Tracy spends (hrs)

and $\frac{1}{10}x + \frac{1}{12}(x+2) = 1$

LCD = 60, again

$$\frac{6x + 5(x+2)}{60} = \frac{60}{60}$$

$$\Rightarrow 6x + 5x + 10 = 60 \rightarrow 11x = 50$$

$$\& x + 2 = \frac{50 + 22}{11} = \frac{72}{11} = x + 2$$

$$x = \frac{50}{11}$$

121 T1

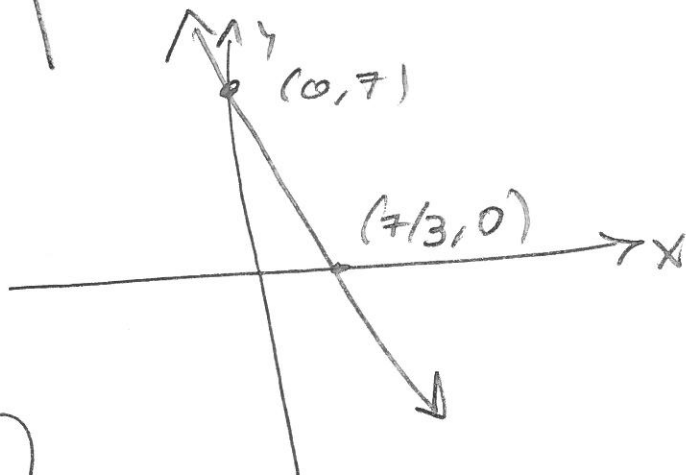
(3)

$$y = -3x + 7$$

5 pts

x	y
0	7
$\frac{7}{3}$	0

$$-3x + 7 = 0 \rightarrow -3x = -7 \rightarrow x = \frac{7}{3}$$



(4) 5 pts

$$f(x) = x^2 - 6x - 11$$

$$= x^2 - 6x + 3^2 - 9 - 11$$

$$= (x-3)^2 - 20 = f(x)$$

5 pts

$$x^4 - 16 = 0$$

$$(x^2 - 4)(x^2 + 4) = 0$$

$$(x-2)(x+2)(x-2i)(x+2i) = 0$$

$$\rightarrow x = \pm 2, \pm 2i \quad \text{OR} \quad x \in \{\pm 2, \pm 2i\}$$