121 - G11 TEST 1 HARRY MILLS

(1) $5x-1 = 3x+2$

$-3x \quad = -3x$

$2x-1 = 2$

$+1 = +1$

$2x = 3$

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

(2) $\frac{2}{3}x + \frac{12}{5} = \frac{1}{2}$

LCD $= 3 \cdot 5 \cdot 2 = 30$

$\frac{2x}{3} \cdot \frac{10}{10} + \frac{12}{5} \cdot \frac{6}{6} = \frac{1}{2} \cdot \frac{15}{15}$

$\frac{20x+72}{LCD} = \frac{15}{LCD}$

$20x + 72 = 15$

$20x = -57$

$x = -\frac{57}{20}$

B

The actual prob was

$\frac{2}{7}x + \frac{12}{5} = \frac{1}{2}$

$72 - 15 = 57$

(3) $6x^2 = 47$

$x^2 = \frac{47}{6}$

$x = \pm\sqrt{\frac{47}{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{\pm\sqrt{282}}{6} = x$

$47 \cdot 6 = 282$

$282 = 2 \cdot 3 \cdot 47$

47 is prime.

(4) $3x^2 - 28x + 67 = 0$

$a = 3, b = -28, c = 67 \Longrightarrow$

$b^2 - 4ac = (-28)^2 - 4(3)(67)$

$= 784 - 804$

$= -20$

$20 = 2 \cdot 2 \cdot 5$

$\sqrt{20} = 2\sqrt{5}$

$\sqrt{-20} = 2i\sqrt{5}$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{28 \pm 2i\sqrt{5}}{2(3)}$

$= \frac{2(14 \pm i\sqrt{5})}{2(3)} = \frac{14 \pm i\sqrt{5}}{3}$

(5) $9x^2 + 12x + 4 = 0$

$a = 9,\ 12 = b,\ c = 4$

$b^2 - 4ac = 12^2 - 4(9)(4)$

$= 144 - 144 = 0$

→ one, real (repeated) soln.

Extra comments: (Don't worry about.)

$(3x + 2)^2 = 0$

$3x+2 = 0$

$3x = -2$

$x = -\frac{2}{3}$

"Root of multiplicity $m = 2$." ← "work twice."

(6) $4x^2 - 20x + 29 = 0$

$a = 4, b = -20, c = 29$

$b^2 - 4ac = (-20)^2 - 4(4)(29)$

$= 400 - 464$

$= -64$ ⟹

2 nonreal roots

(7) $6x^2 = 47$

$6x^2 - 47 = 0$

$6x^2 + 0x - 47 = 0$

$a = 6, b = 0, c = -47$

$b^2 - 4ac = 0^2 - 4(6)(-47)$

$= 1128$ ⟹

2 real solns

2 | 1128
2 | 564
2 | 282
3 | 141
47

(8) $x^2 - 3x - 28 = 0$

$x^2 - 7x + 4x - 28 = 0$

$x(x-7) + 4(x-7) = 0$

$(x-7)(x+4) = 0$

$x \in \{-4, 7\}$

(9) $8x^2 + 22x - 105$

$a = 8,\ b = 22,\ c = -105$

$b^2 - 4ac = 22^2 - 4(8)(-105)$

$= 3844$

3844

$\sqrt{3844} = 62$!

$x = \frac{-22 \pm 62}{2(8)} = \frac{-11 \pm 31}{8}$

$\frac{20}{8} = \frac{5}{2}$

$\frac{-42}{8} = \frac{-21}{4}$

So, $x \in \{-\frac{21}{4}, \frac{5}{2}\}$ and it factors thusly:

$8(x - \frac{5}{2})(x + \frac{21}{4})$

$= 4 \cdot 2(x - \frac{5}{2})(x + \frac{21}{4})$

$= (2x-5)(4x+21)$

(10) $x^2+4x+49=0$

$x^2+4x+2^2=-49+4=-45$

$\frac{4}{2}=2 \rightsquigarrow 2^2=4$

$(x+2)^2=-45$

$3\,|\,45$, $3\,|\,15$, 5

$x+2=\pm\sqrt{-45}=\pm i\cdot 3\sqrt{5}$

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

(11) $5x^2+6x-9=0$

$x^2+\frac{6}{5}x-\frac{9}{5}=0$

$x^2+\frac{6}{5}x+\left(\frac{3}{5}\right)^2=\frac{9}{5}+\frac{9}{25}=\frac{9}{5}\cdot\frac{5}{5}+\frac{9}{25}$

$=\frac{45+9}{25}=\frac{54}{25}$

$\left(x+\frac{3}{5}\right)^2=\frac{54}{25}$

$x+\frac{3}{5}=\pm\sqrt{\frac{54}{25}}=\pm\frac{\sqrt{54}}{5}$

$2\,|\,54$, $3\,|\,27$, $3\,|\,9$, 3

$\sqrt{54}=3\sqrt{6}$

$$x=-\frac{3}{5}\pm\frac{3\sqrt{6}}{5}$$

$x\in\left\{\frac{-3\pm 3\sqrt{6}}{5}\right\}$

(12) $\parallel$ to $y = \frac{2}{3}x + 13$, thru $(5, -7)$

(a) $m_{\parallel} = m = \frac{2}{3} \Rightarrow$ point-slope.

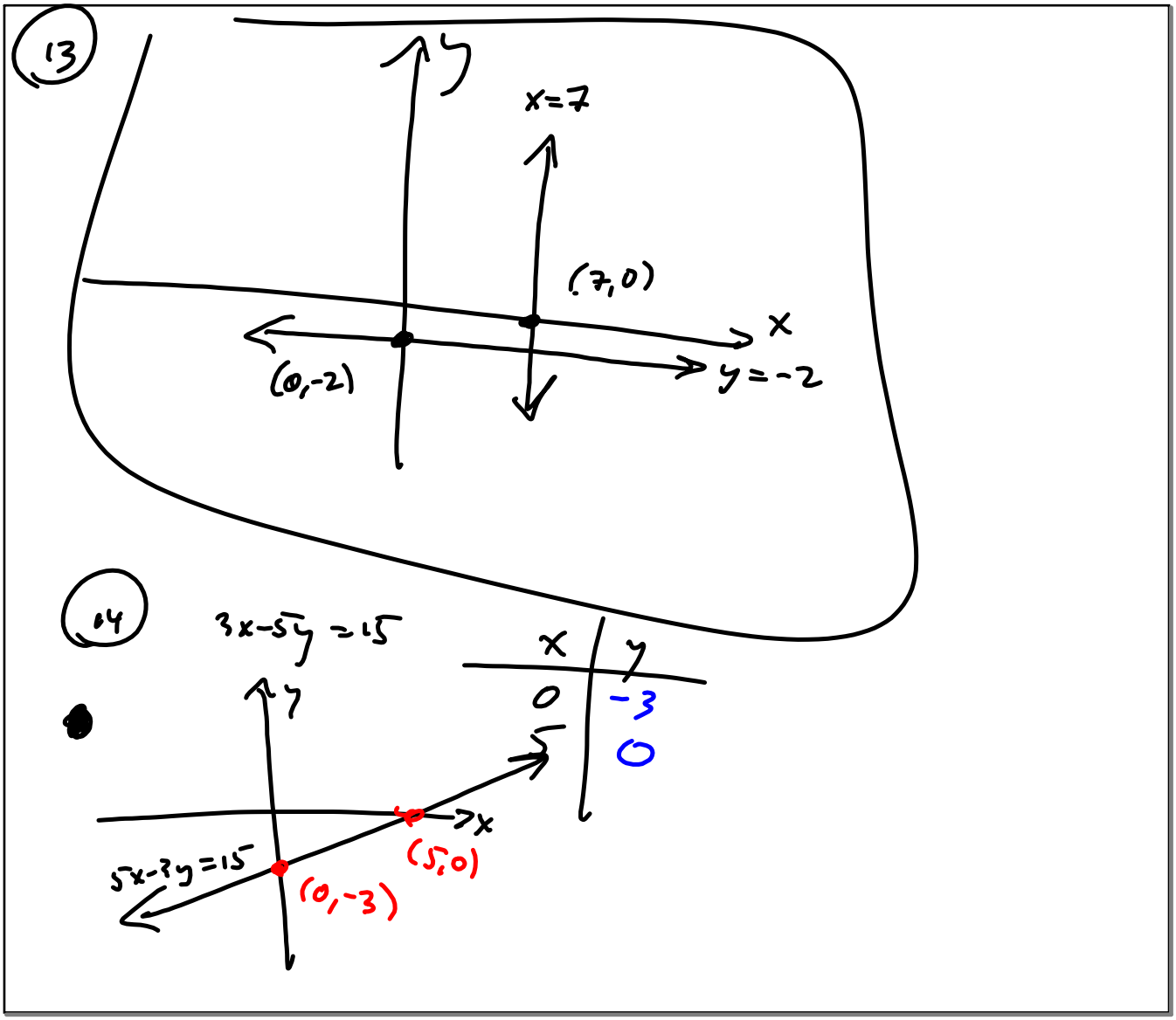
$y = m(x - x_1) + y_1$

$y = \frac{2}{3}(x - 5) - 7$

(b) $\perp$ to it, thru $(5, -7)$

$m_{\perp} = -\frac{1}{m} = -\frac{3}{2}$

$y = -\frac{3}{2}(x - 5) - 7$

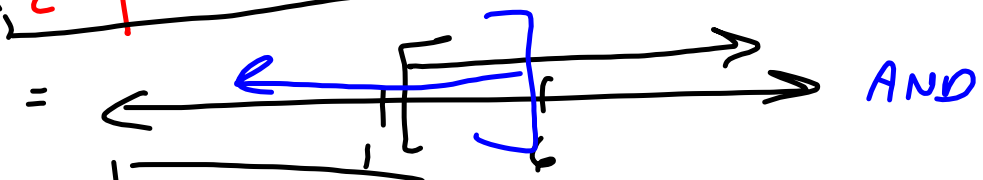

13
y
x=7
(7,0)
x
(0,-2)
y=-2
14
3x-5y=15
y
x
5x-3y=15
(5,0)
(0,-3)
x y
0 -3
5 0

15a $|2x-7| \leq 5$

$2x-7 \leq 5$ AND $2x-7 \geq -5$

$2x \leq 12$ $2x \geq 2$

$\{x \mid x \leq 6$ AND $x \geq 1\}$



$= [-1, 6]$

(b) $|-2x+7| < 5$

$-2x+7 < 5$ AND $-2x+7 > -5$

$-2x < -2$ $\quad -2x > -12$

$\frac{-2x}{-2} > \frac{-2}{-2}$ $\quad \frac{-2x}{-2} < \frac{-12}{-2}$

$\{x \mid x > 1$ AND $x < 6\}$

$-5 < -2x+7 < 5$ is ok, but in very poor taste.

$|-2x+7| > 5$

$-5 > -2x+7 > 5$ } No! $-5 > 5$?!

$|-2x+7| < 5$

$|-2x+7| = |-1(2x-7)| = |-1||2x-7|$

$= |2x-7|$

So, this is actually

$|-2x+7| = |2x-7| < 5$!

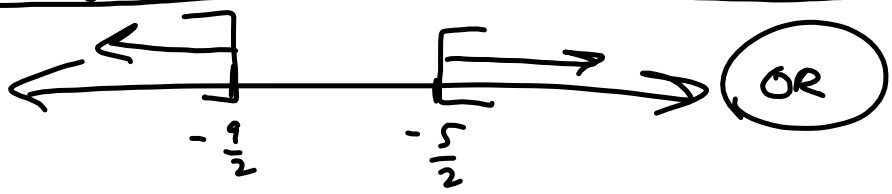
(c) $|2x+7|+3 \geq 5$

$|2x+7| \geq 2$

$2x+7 \geq 2$ OR $2x+7 \leq -2$

$2x \geq -5$ $\quad 2x \leq -9$

$\{x \mid x \geq -\frac{5}{2}$ OR $x \leq -\frac{9}{2}\}$

$=$ 

$= (-\infty, -\frac{9}{2}] \cup [-\frac{5}{2}, \infty)$

(d) $|5x-3|+6<3$

$|5x-3|<-3$ $\varnothing$

Nevah!

(16) How much 37% alc. must be added to 75% to get 50 gals of 50% alc.?

Let x = amt of 37% alcohol used (gals)

y = " " 75% " " "

	V	Pure Alc.
37%	x	$.37x$
75%	y	$.75y$
Final mix	$x+y$	$.5(x+y) = .5(50)$

$x+y=50 \rightarrow y=50-x$

$.37x+.75y=.5(x+y)$ → $x+50-x$, i.e., 50!

$.37x+.75(50-x)=.5(50)$

(17) Let x = how much she won before taxes ($)

$\frac{1}{2}x$ to gov't

$\frac{1}{3}$ of what was left went to 3% Bonds

$\frac{2}{3}$ " " " " " " 8% stock

$\frac{1}{2}x$ is whats left to play with.

and $\frac{1}{3}$ of that is $\frac{1}{3}(\frac{1}{2}x)$ spent on bonds.

$\frac{2}{3}(\frac{1}{2}x)$ is spent on stock

$\frac{2}{6} = \frac{1}{3}$

EARNINGS $.03(\frac{1}{6}x) + .08(\frac{2}{6}x) = 950$

In the book, we had $\frac{1}{2}$ to gummint

$\frac{1}{3}$ to bonds

$\frac{1}{6}$ to stock

& eq'n looked like:

$(.03)(\frac{1}{3}x) + (.08)(\frac{1}{6}x) = 950$

B1

$\frac{1}{6}x + \frac{1}{10}x = 1$

x = amt of time Tamara works

B2 Tamara starts 2 hours late.

Let x = amt of time Tamara works.

Then $\frac{1}{6}x + \frac{1}{10}(x+2) = 1$

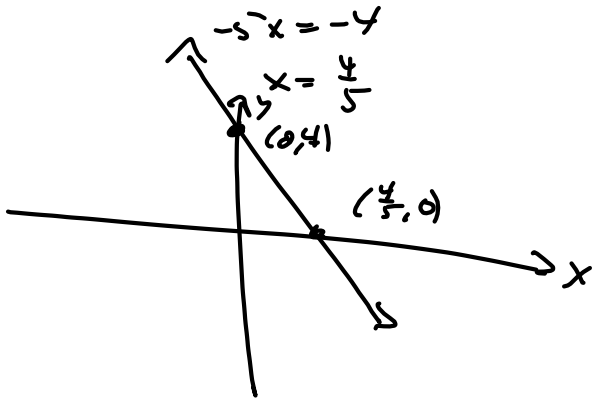
Let x = amt of time Bill works

Then $\frac{1}{6}(x-2) + \frac{1}{10}x = 1$

B3 $y = -5x + 4$ SET 0 →

$-5x = -4$

$x = \frac{4}{5}$



B4

$y = 3(x^2 + \frac{4}{3}x + \frac{9}{3})$

$= 3(x^2 + \frac{4}{3}x + (\frac{2}{3})^2 - \frac{4}{9} + \frac{9}{3})$

$= 3(x + \frac{2}{3})^2 + 3(-\frac{4}{9} + \frac{9}{3})$

$= 3(x + \frac{2}{3})^2 + \frac{23}{3}$

$-\frac{4}{3} + 9$

$= \frac{-4+27}{3}$

$=$

B5 $5\sqrt{x+3} = x+5$

$25(x+3) = x^2 + 10x + 25$

$25x + 75 = x^2 + 10x + 25$

$x^2 - 15x - 50 = 0$

$b^2 - 4ac = 225 - 4(1)(50)$

$= 225 + 600$

$= 825$

$x = \frac{15 \pm \sqrt{825}}{2(1)}$ = messy & didn't check (Extraneous)