

1) 10 pts

$$(x+5)^3(x-(2-7i))(x-(2+7i))(x-2)^2$$

2)

3 |

$$3 \quad -2 \quad 17 \quad 1 \quad -10 \quad -4$$

10 pts

	9	21	114	345	1005
3	7	38	115	335	1001 = P(3)
x^4	x^3	x^2	x	c	

$$\begin{array}{r} 335 \\ 3 \\ \hline 1005 \end{array}$$

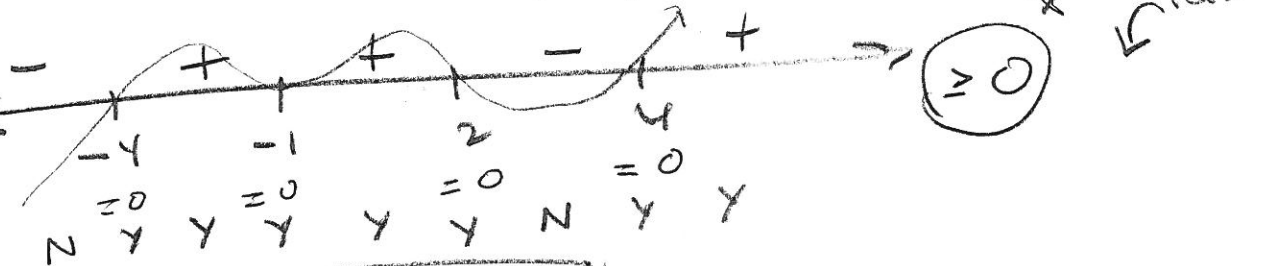
3) 5 pts

$$P(x) = (x-3)(3x^4 + 7x^3 + 38x^2 + 115x + 335) + 1001$$

4) $f(x) = (x+1)^2(x-2)^3(x+4)(x-4) = x^7 + \dots + 128$

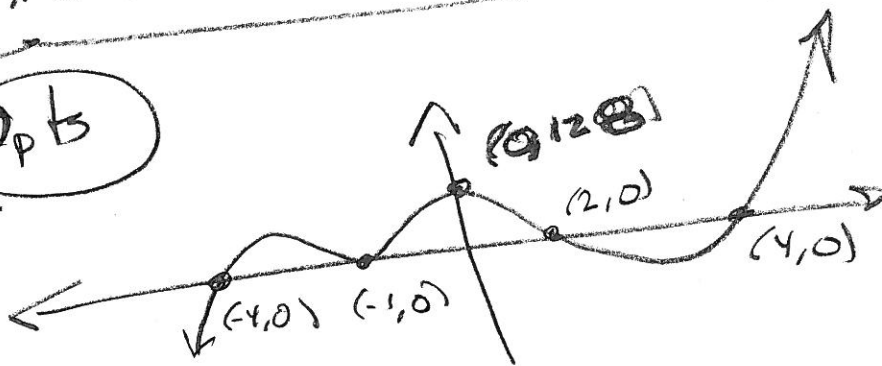
-1, -4, 2, 4

a) 5 pts



$$x \in [-4, 2] \cup [4, \infty)$$

b) 10 pts



(40)



(5pts)

$$\rightarrow x \in (-4, -1) \cup (-1, 2] \cup [4, \infty)$$

(5) $f(x) = 4x^5 - 12x^4 - 5x^3 + 21x^2 - 11x - 21$

(a) (5pts)

3 or 1 positive roots

$$f(-x) = -4x^5 - 12x^4 + 5x^3 + 21x^2 + 11x - 21$$

2 or 0 negative roots

(b) (5pts) $p = -21, q = 4$

1, 3, 7 1, 2, 4

$$\pm 1, \pm 3, \pm \frac{3}{2}, \pm \frac{3}{4}, \pm \frac{1}{2}, \pm \frac{1}{4}$$

$$\pm 7, \pm \frac{7}{2}, \pm \frac{7}{4}, \pm 21, \pm \frac{21}{2}, \pm \frac{21}{4}$$

12 of 'em

(c) $-2 \mid 4 \quad -12 \quad -5 \quad 21 \quad -11 \quad -21$

$-8 \quad 40 \quad -70 \quad 98 \quad -174$

4 $-2 \quad 35 \quad -49 \quad 87$ Neg

Alternates. $-2 \mid 3$ l.b.

$-2, 3$ l.b.

(5pts) $4 \mid 4 \quad -12 \quad -5 \quad 21 \quad -11 \quad -21$

$16 \quad 16 \quad 44 \quad 87$ BIG Real BIG

4 $4 \quad 11 \quad 65$ BIG Positive

$x = 4, 3$ u.b.

6 (10pts)

$$\begin{array}{r} 1 \mid 4 \quad -12 \quad -5 \quad 21 \quad -11 \quad -21 \\ \quad \quad \quad 4 \quad -8 \quad -13 \quad 8 \quad \text{No} \\ \hline 4 \quad -8 \quad -13 \quad 8 \quad -3 \end{array}$$

$$\begin{array}{r} 3 \mid 4 \quad -12 \quad -5 \quad 21 \quad -11 \quad -21 \\ \quad \quad \quad 12 \quad 0 \quad -15 \quad 18 \quad 21 \\ \hline 4 \quad 0 \quad -5 \quad 6 \quad 7 \quad 0 \end{array}$$

$$\begin{array}{r} 3 \mid 4 \quad 0 \quad -5 \quad 6 \quad 7 \quad 0 \\ \quad \quad \quad 12 \quad 36 \quad 93 \\ \hline 4 \quad 12 \quad 31 \quad \text{TOO BIG} \end{array}$$

$x=3, m=1$

$$\begin{array}{r} -1 \mid 4 \quad 0 \quad -5 \quad 6 \quad 7 \\ \quad \quad \quad -4 \quad 4 \quad 1 \quad -7 \\ \hline -1 \mid 4 \quad -4 \quad -1 \quad 7 \quad 0 \\ \quad \quad \quad -4 \quad 8 \quad -7 \\ \hline 4 \quad -8 \quad 7 \quad 0 \end{array}$$

$x=-1, m=2$

$a=4, b=-8, c=7 \Rightarrow \Delta$

$$\begin{array}{r} 4 \times 6 \\ \quad 7 \\ \hline 112 \end{array}$$

$\Rightarrow b^2 - 4ac = (-8)^2 - 4(4)(7) = 64 - 112 = -48 < 0$

So $f(x) = (x-3)(x+1)^2(4x^2 - 8x + 7)$

7 $x = \frac{8 \pm \sqrt{-48}}{2(4)} = \frac{8 \pm 4i\sqrt{3}}{8} = \frac{2 \pm i\sqrt{3}}{2}$

$$\begin{array}{r} 2 \mid 48 \\ \quad 2 \mid 24 \\ \quad \quad 2 \mid 12 \\ \quad \quad \quad 2 \mid 6 \\ \quad \quad \quad \quad 3 \end{array}$$

5pts

$$f(x) = 4(x-3)(x+1)^2 \left(x - \left(\frac{2+i\sqrt{3}}{2}\right)\right) \left(x - \left(\frac{2-i\sqrt{3}}{2}\right)\right)$$

121

T3

$$\textcircled{8} \textcircled{\text{spB}} R(x) = \frac{2x^3 + 5x^2 - 13x - 30}{x^2 + 3x - 4} = \frac{2x^3 + 5x^2 - 13x - 30}{(x+4)(x-1)} \quad \textcircled{4}$$

V.A.: "No holes" hint \rightarrow

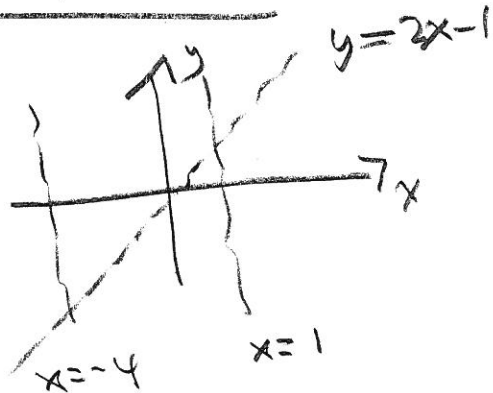
$x = -4, x = 1$ are vertical asymptotes

Oblique:

$$\begin{array}{r} 2x - 1 \\ x^2 + 3x - 4 \overline{) 2x^3 + 5x^2 - 13x - 30} \\ \underline{-(2x^3 + 6x^2 - 8x)} \\ -x^2 - 13x - 30 \end{array}$$

$$y = 2x - 1 \text{ is O.A.}$$

$$(0, -1), \left(\frac{1}{2}, 0\right)$$



121

T3

5

9 opt B

$$f(x) = \frac{x^2 + 3x - 4}{2x^2 - x - 10} = \frac{(x+4)(x-1)}{(2x-5)(x+2)}$$

$$D = \mathbb{R} \setminus \left\{ -2, \frac{5}{2} \right\} \rightarrow \text{V.A. are } x = \frac{5}{2}, x = -2$$

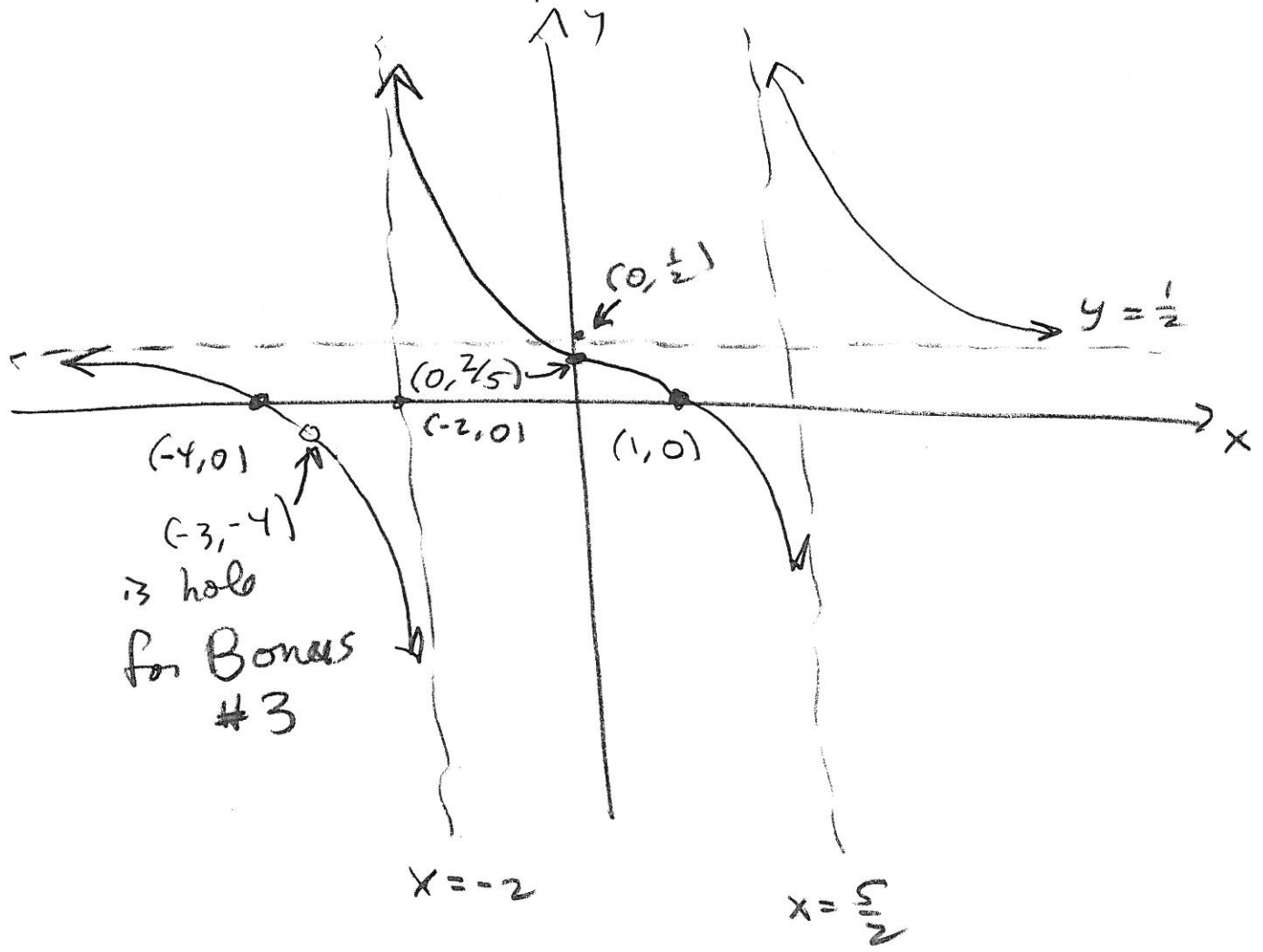
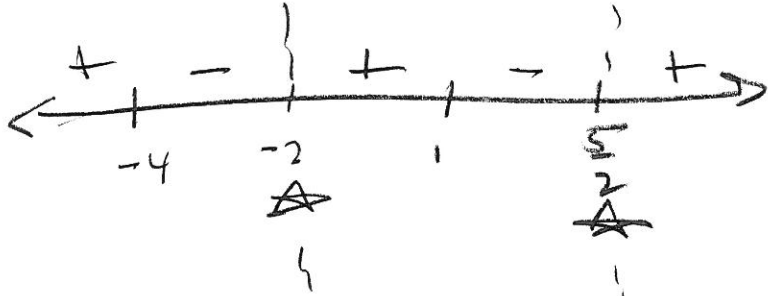
$$\text{H.A.} = \frac{x^2}{2x^2} = \frac{1}{2} = y$$

(No holes)
(No cancellations)

critical =

$$x = -2, \frac{5}{2}, -4, 1$$

$$f(0) = \frac{-4}{-10} = \frac{2}{5}$$



121

T3

(6)

(B1) (5pts) $(x - (3 - \sqrt{7}))^2 (x - (3 + \sqrt{7}))^2 (x - (2 + 7i))$

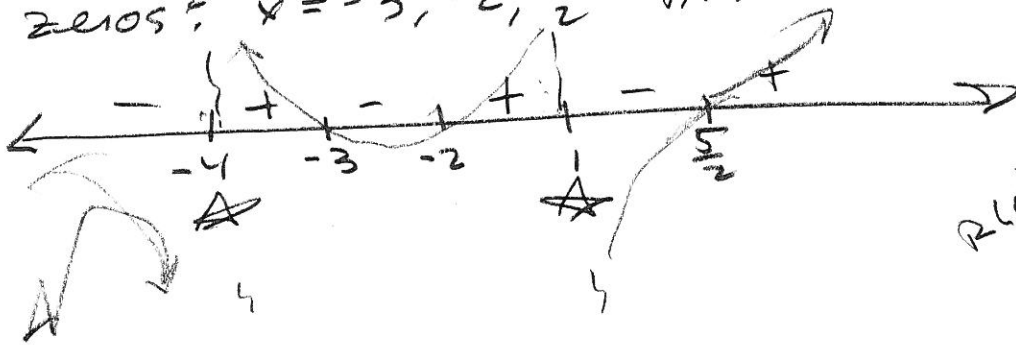
$(x - (2 - 7i)) (x - 4)^{17} = P(x)$

(B2) (5pts)

$$\begin{array}{r|rrrr} -3 & 2 & 5 & -13 & -30 \\ & & -6 & 3 & 30 \\ \hline & 2 & -1 & -10 & 0 \end{array}$$

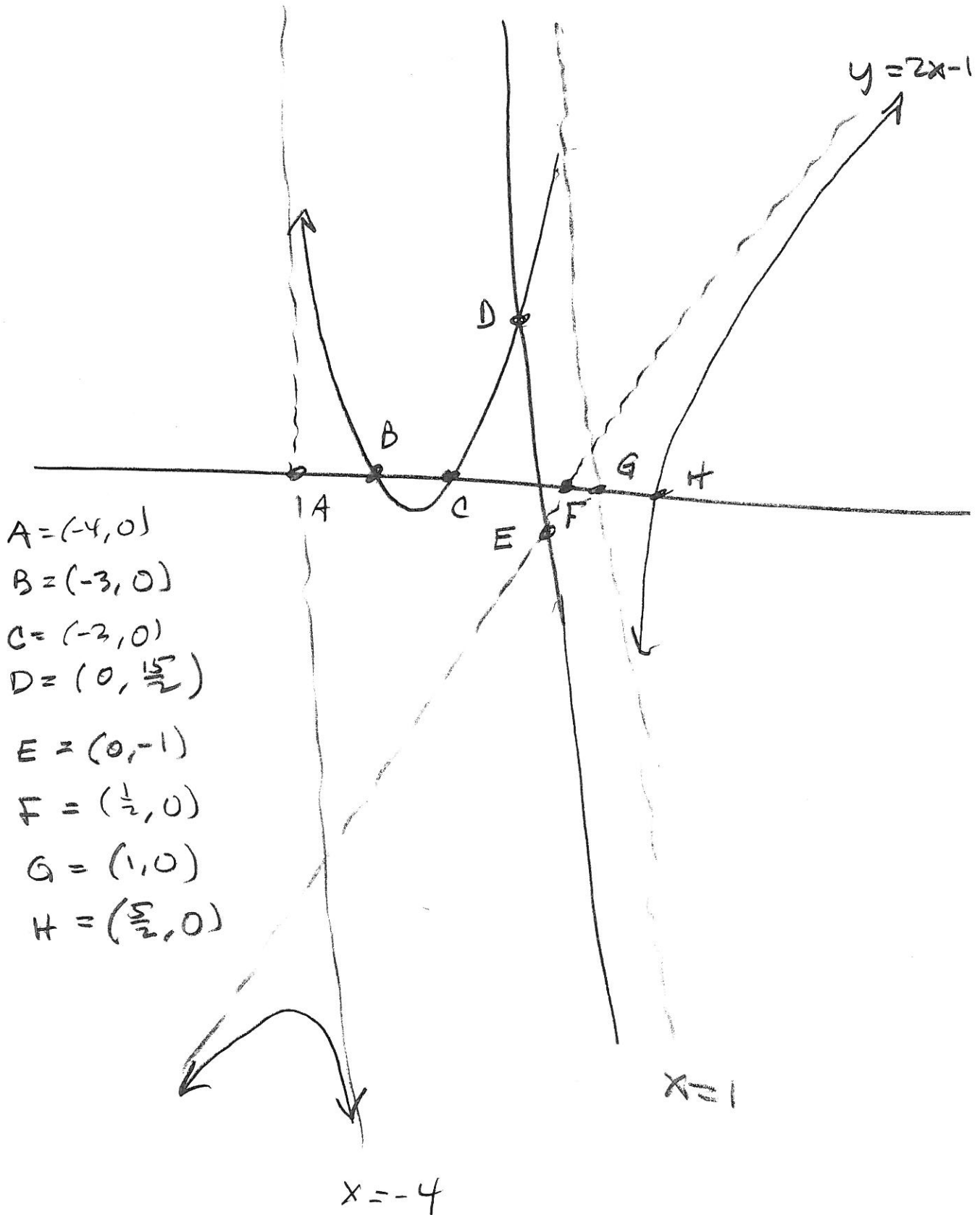
$$2x^2 - x - 10 = (2x - 5)(x + 2)$$

zeros: $x = -3, -2, \frac{5}{2}$ VA: $x = -4, 1$



$$R(0) = \frac{-30}{-4} = 7.5$$

B2 cont'd



121

73

(8)

(B3)

$$G(x) = \frac{x^3 + 6x^2 + 5x - 12}{2x^3 + 15x^2 - 13x - 80}$$

Same as #9 but hole, so

$$\frac{(x^2 + 3x - 4)(x - ?)}{(2x^2 + 10x - 10)(x - ?)} = \frac{(x+4)(x-1)(x-?)}{(x+4)(x-1)(x-?)}$$

$$\begin{array}{r} \downarrow \\ 1 \quad 6 \quad 5 \quad -12 \\ \quad 1 \quad 7 \quad 12 \\ \hline 1 \quad 7 \quad 12 \quad 0 \end{array}$$

$x^2 + 7x + 12 = (x+3)(x+4)$, so $x+3$ is
new factor \Rightarrow hole @ $x = -3$

$$F(-3) = \frac{(-3+4)(-3-1)}{(2(-3)+5)(-3+2)} = \frac{(1)(-4)}{(-1)(-1)} = -4$$

Hole @ $(-3, -4)$ is #9 graph is only
change.

121

T3

(9)

(BY)

$$|-3x+2| - 5 < 2 \rightarrow$$

$$|-3x+2| < 7$$

$$\begin{aligned} \text{M1} \\ -3x+2 < 7 \quad \text{and} \quad -3x+2 > -7 \\ -3x < 5 \qquad \qquad \qquad -3x > -9 \end{aligned}$$

$$\left\{ x \mid x > -\frac{5}{3} \quad \text{and} \quad x < 3 \right\}$$

=

= $(-\frac{5}{3}, 3)$

$$\begin{aligned} \text{M2: } |-3x+2| &= |-1(3x-2)| = |-1| |3x-2| \\ &= |3x-2| \quad \text{so,} \end{aligned}$$

$$3x-2 < 7$$

$$3x < 9$$

$$\left\{ x \mid x < 3 \right.$$

$$\text{and } 3x-2 > -7$$

$$3x > -5$$

$$x > -\frac{5}{3} \left. \right\} \text{, etc.}$$

121
BS

T3

10

Let $x =$ the # of hours John works
and $y =$ " " " " Jill works

Then $y = x - 2$ & so

$$\frac{1}{6}x + \frac{1}{4}(x-2) = 1$$

LCD = 12 \rightarrow

$$\frac{x}{6} \cdot \frac{2}{2} + \frac{(x-2) \cdot 3}{4 \cdot 3} = \frac{12}{12}$$

$$2x + 3x - 6 = 12$$

$$5x = 18$$

$$x = \frac{18}{5}$$

3.6

hrs \Rightarrow

$$y = \frac{18}{5} - \frac{2}{1} \cdot \frac{1}{5} = \frac{8}{5} = y$$

1.6