121 TEST 3 FALL 2019

(1) (10pts) $(x+5)^3(x-(2-7i))(x-(2+7i))(x-2)^2$

(2) (10pts)

	3	−2	17	1	−10	−4
3		9	21	114	345	1005
	3	7	38	115	335	1001 = P(3)
	x^4	x^3	x^2	x	C	

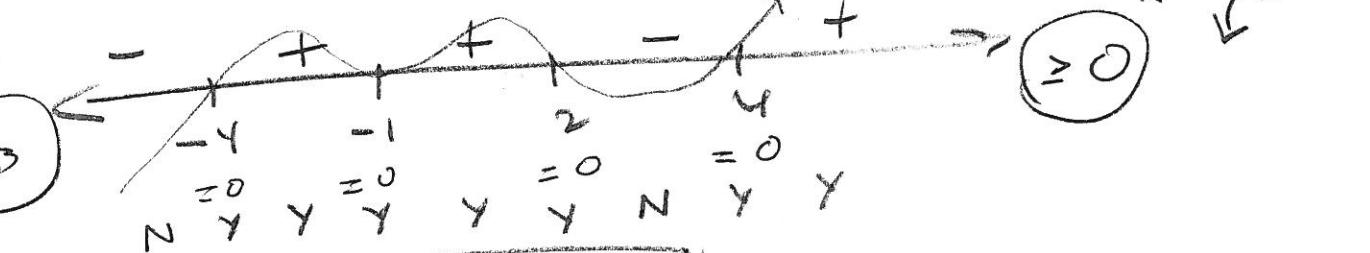
335
3
1005

(3) (5pts) $P(x) = (x-3)(3x^4+7x^3+38x^2+115x+335)+1001$

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

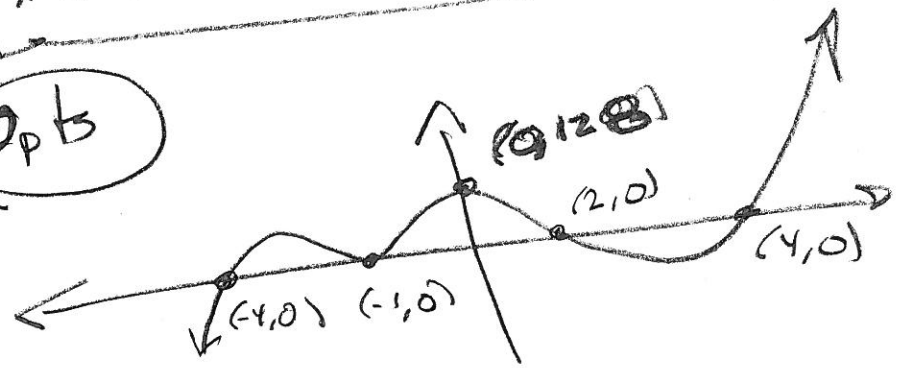
-1, -4, 2, 4

(a) (5pts)



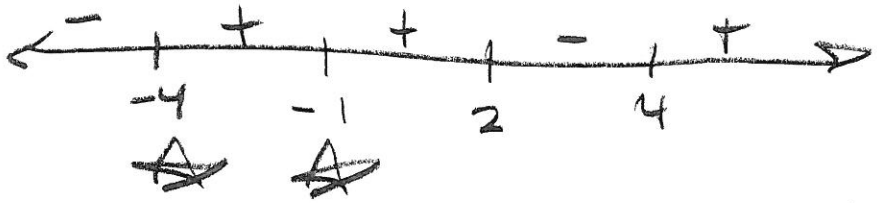
$x \in [-4, 2] \cup [4, \infty)$

(b) (10pts)



121 #3

4c



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 $p = -21$, $q = 4$

p: 1, 3, 7 $\quad$ q: 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) 5pts

-2 | 4 −12 −5 21 −11 −21

		−8	40	−70	98	−174
4	−2	35	−49	87	Neg

Alternates. -2 l.b.

-2, 3 l.b.

4 | 4 −12 −5 21 −11 −21

		16	16	44	BIG	Real BIG
4	4	11	65	BIG	Positive

$x = 4$, 3 u.b.

12.1 T3 (3)

(6) (10pts)

1] 4 -12 -5 21 -11 -21

	4	-8	-13	8	No
4	-8	-13	8	-3	

3] 4 -12 -5 21 -11 -21

	12	0	-15	18	21
4	0	-5	6	7	0

3] 4 0 -5 6 7

	12	36	93	
4	12	31	TOO BIG	

$x=3, m=1$

-1] 4 0 -5 6 7

	-4	4	1	-7
4	-4	-1	7	0

-1] 4 -4 -1 7

	-4	8	-7
4	-8	7	0

$x=-1, m=2$

$4,6$
7
112

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

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

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

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

$2|48$
$2|24$
$2|12$
$2|6$
3

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

(4)

(8) (5pts) $R(x) = \dfrac{2x^3+5x^2-13x-30}{x^2+3x-4} = \dfrac{2x^3+5x^2-13x-30}{(x+4)(x-1)}$

V.A.: "No holes" hint →

$\boxed{x=-4,\ x=1}$ are vertical asymptotes

Oblique:

$$x^2+3x-4 \;\overline{)\; 2x^3+5x^2-13x-30}$$

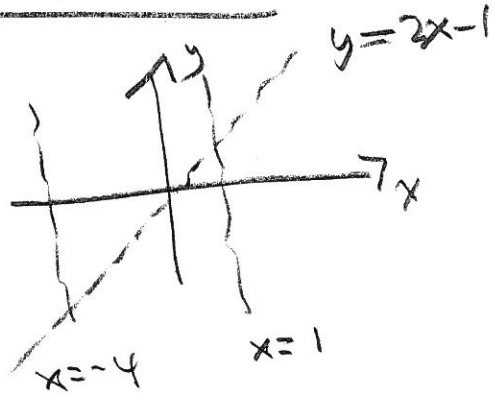
$2x-1$

$-(2x^3+6x^2-8x)$

$-x^2$

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

$(0,-1),\ (\tfrac{1}{2},0)$



12.1 T3 (5)

(9) (10pts) $f(x) = \dfrac{x^2+3x-4}{2x^2-x-10} = \dfrac{(x+4)(x-1)}{(2x-5)(x+2)}$

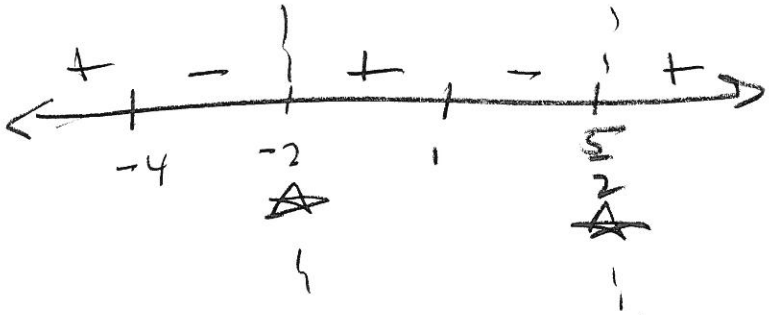
$D = \mathbb{R} \setminus \{-2, \frac{5}{2}\}$ → V.A. are $x = \frac{5}{2}$, $x = -2$

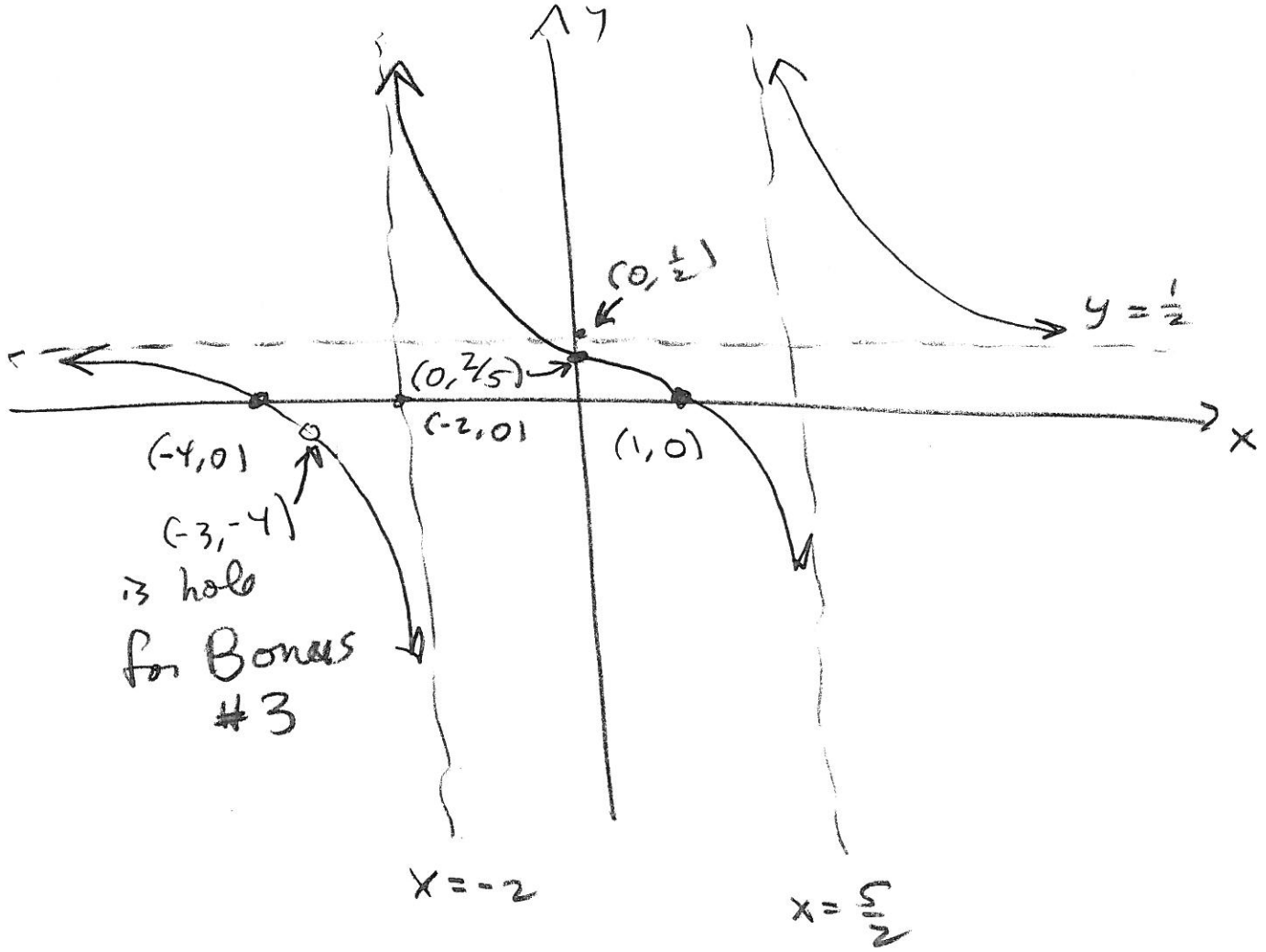
(b/c no holes)
(No cancellations)

H.A.: $\dfrac{x^2}{2x^2} = \dfrac{1}{2} = y$

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

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





12.1 T3 (6)

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

• $(x-(2-7i))(x-4)^{17} = P(x)$

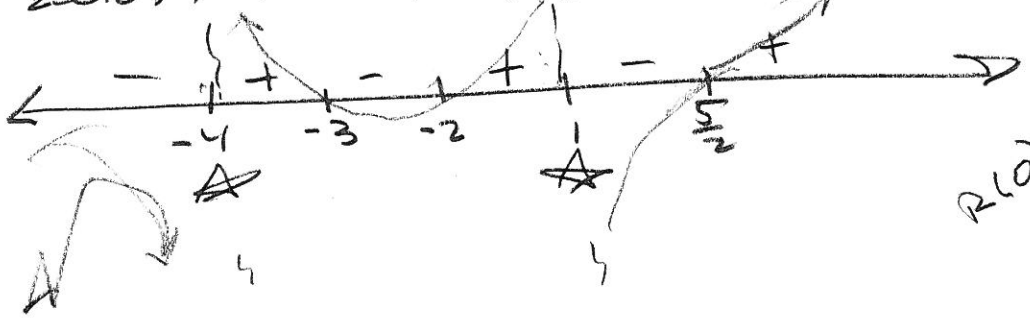
B2 5pts $-3 \mid 2 \quad 5 \quad -13 \quad -30$

$\quad\quad\quad -6 \quad 3 \quad 30$

$\quad\quad 2 \quad -1 \quad -10 \quad 0$

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

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

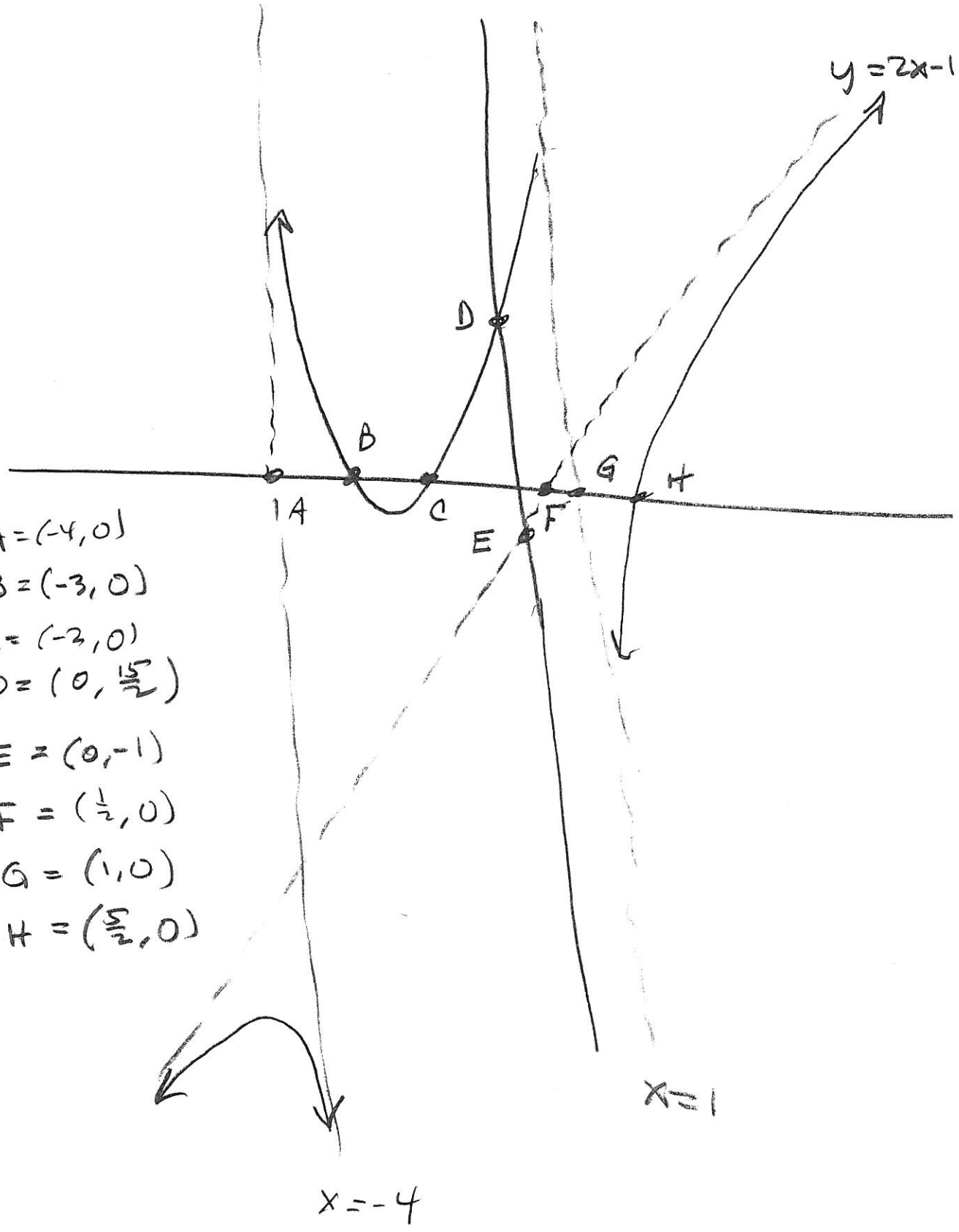


$R(0) = \frac{-30}{-4} = \frac{15}{2}$

T3

(7)

B2 cont'd



A = (-4, 0)

B = (-3, 0)

C = (-2, 0)

D = $(0, \frac{15}{2})$

E = (0, -1)

F = $(\frac{1}{2}, 0)$

G = (1, 0)

H = $(\frac{5}{2}, 0)$

B3 $G(x) = \dfrac{x^3+6x^2+5x-12}{2x^3+15x^2-13x-80}$

Same as #9 but hole, so

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

$$\begin{array}{r|cccc} 1 & 1 & 6 & 5 & -12 \\ & & 1 & 7 & 12 \\ \hline & 1 & 7 & 12 & 0 \end{array}$$

$x^2+7x+12 = (x+3)(x+4)$, 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 @ $(-3,-4)$ in #9 graph is only change.

121 T3 (9)

(B4) $|-3x+2| - 5 < 2 \longrightarrow$

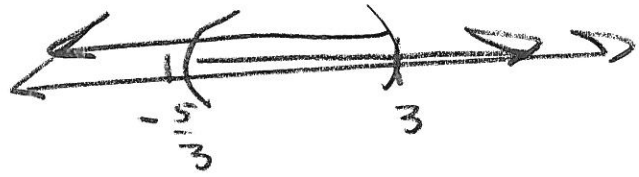
$|-3x+2| < 7$

M1

$-3x+2 < 7$ and $-3x+2 > -7$

$-3x < 5$ $\quad -3x > -9$

$\{x \mid x > -\frac{5}{3}$ and $x < 3\}$

$=$ 

$= (-5/3, 3)$

(E-) M2: $|-3x+2| = |-1(3x-2)| = |-1|\,|3x-2|$

$= |3x-2|$! so,

$3x-2 < 7$ and $3x-2 > -7$

$3x < 9$ $\quad 3x > -5$

$\{x \mid x < 3$ and $x > -\frac{5}{3}\}$, etc.

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T3

(10)

(B5)

Let x = the # of hours John works

and y = " " " " Jill works

Then $y = x - 2$ also

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

LCD = 12 ⟶

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

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

$$5x = 18$$

$$\boxed{x = \frac{18}{5}} \text{ hrs} \Rightarrow y = \frac{18}{5} - \frac{2}{1}\cdot\frac{5}{5} = \boxed{\frac{8}{5} = y}$$

3.6

1.6