121 PT #2

(3) $R = \{(1,3), (2,7), (3,4), (4,-2)\}$

5 (a) R is a func. $\boxed{\text{Yes}}$

5 (b) $\mathcal{D} = \{1,2,3,4\}$

5 (c) $\mathcal{R} = \{3,7,4,-2\}$

5 (d) R is 1-to-1. $\boxed{\text{Yes}}$

(3) $f(x) = \sqrt{x+20}$ & $g(x) = x^2 - 13x + 22$

5 (a) $\mathcal{D}(f) = \{x \mid x \geq -20\} = \boxed{[-20, \infty)}$

5 (b) $\boxed{\mathcal{D}(g) = \mathbb{R}}$

(c) $\frac{f}{g} = \frac{\sqrt{x+20}}{x^2-13x+22}$

(d) $\mathcal{D}\left(\frac{f}{g}\right) = \{x \mid x \geq -20$ & $g(x) \neq 0\}$
($\mathcal{D}(g) = \mathbb{R}$ is no restriction)

$x^2 - 13x + 22$

$= x^2 - 13x + \left(\frac{13}{2}\right)^2 - \frac{169}{4} + \frac{88}{4}$

$= \left(x - \frac{13}{2}\right)^2 - \frac{81}{4}$ SET 0

$\Rightarrow x = \frac{13}{2} \pm \frac{9}{2}$ $\nearrow \frac{22}{2} = 11$ $\searrow \frac{4}{2} = 2$

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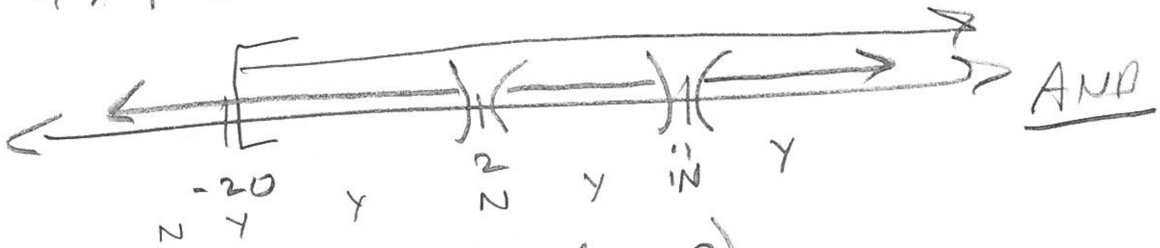
$= \{x \mid x \ge -20 \text{ and } x \ne 11 \text{ and } x \ne 2\}$



$= [-20,2) \cup (2,11) \cup (11,\infty)$

5 (e) $f \circ g = f(g(x)) = \sqrt{g(x)+20}$

$= \boxed{\sqrt{x^2-13x+22+20}}$ STOP!

$= \sqrt{x^2-13x+42}$

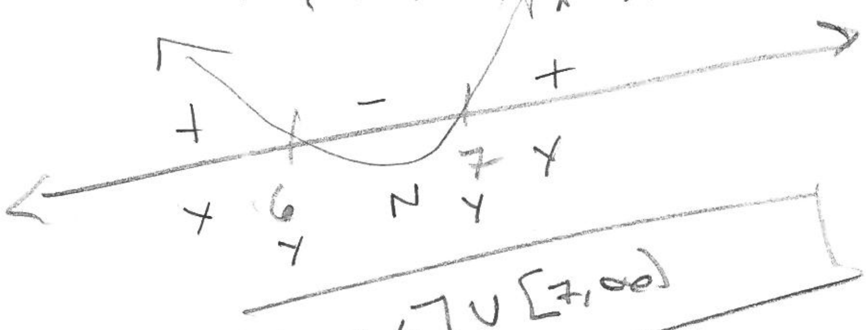
$= \sqrt{(x-7)(x-6)}$

(f) $\mathcal{D}(f \circ g) = \{x \mid x \in \mathcal{D}(g) \text{ and } g(x) \in \mathcal{D}(f)\}$

$= \{x \mid \text{No restriction and } g(x) \ge -20\}$

$= \{x \mid (x-7)(x-6) \ge 0\}$

$x^2-13x+42$



$= \boxed{(-\infty,6] \cup [7,\infty)}$

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(4) $f(x) = 5x^2 + 2x + 1 \longrightarrow$

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

$$= \frac{5(x^2 + 2xh + h^2) + 2x + 2h + 1 - 5x^2 - 2x - 1}{h}$$

$$= \frac{5x^2 + 10xh + 5h^2 + 2h - 5x^2}{h}$$

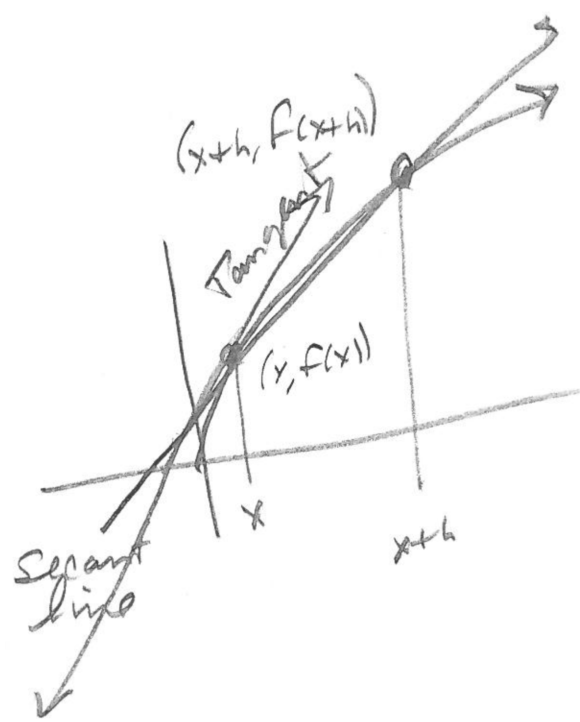
$$= \frac{10xh + 5h^2 + 2h}{h} = \frac{h(10x + 5h + 2)}{h}$$

$$= \boxed{10x + 5h + 2}$$

(5) $f(x) = \sqrt{x} \longrightarrow$

$$\frac{f(x+h) - f(x)}{h} = \frac{\sqrt{x+h} - \sqrt{x}}{h}$$

$= m_{sec}$ = slope of the secant line between $(x, f(x))$ & $(x+h, f(x+h))$



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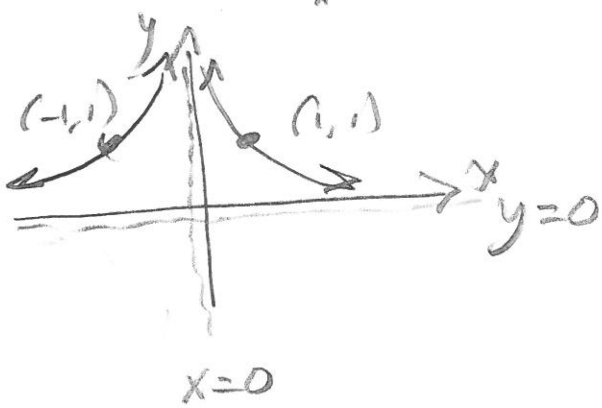
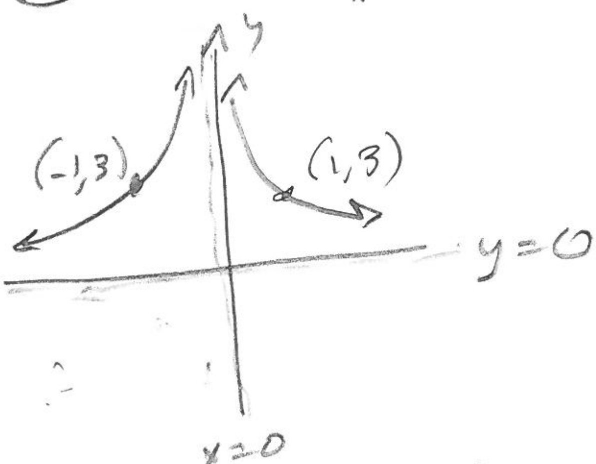
(6) $g(x) = \dfrac{3}{(5x-20)^2} - 7$

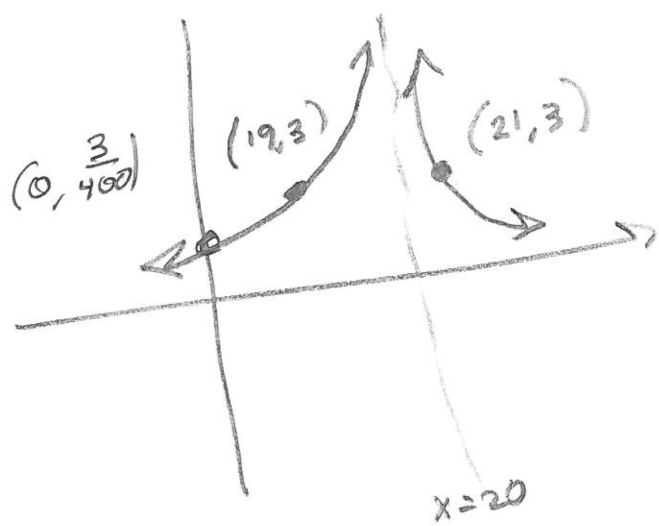
(1) $f(x) = \dfrac{1}{x^2}$



(2) $3f(x) = \dfrac{3}{x^2}$



(3) $\dfrac{3}{(x-20)^2} = 3f(x-20)$



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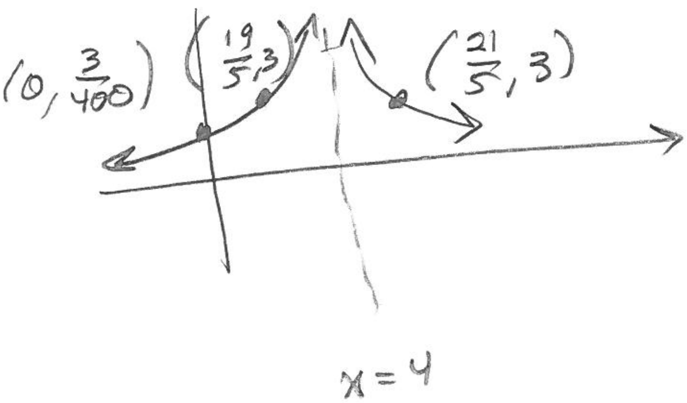
(6) cnt'd

(4) $\dfrac{3}{(5x-20)^2} = 3f(5x-20)$



Scratch:

C, B: $\dfrac{3}{(5x-20)^2} - 7 = 0$

$\dfrac{3}{(5x-20)^2} = 7$

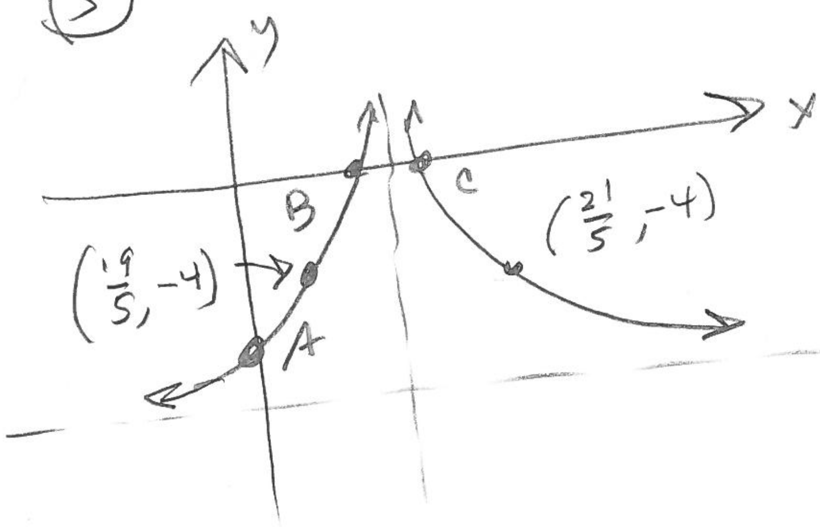
$\dfrac{3}{7} = (5x-20)^2$

$5x-20 = \pm\sqrt{\frac{3}{7}}$

$5x = 20 \pm \dfrac{\sqrt{21}}{7}$

$x = 4 \pm \dfrac{\sqrt{21}}{35}$

(5) $3f(5x-20) - 7 = g(x) = \dfrac{3}{(5x-20)^2} - 7$



A: $\dfrac{3}{400} - 7 = \dfrac{3-2800}{400} = \dfrac{-2797}{400}$

$\boxed{A = (0, -\frac{2797}{400})}$

$= (0, -6.9925)$

$\boxed{\begin{array}{l} B = (4 - \frac{\sqrt{21}}{35}, 0) \\ C = (4 + \frac{\sqrt{21}}{35}, 0) \end{array}}$

$B \approx (3.869069, 0)$

$C \approx (4.13093, 0)$

121 PT #2

(6b) $\boxed{\mathcal{D}(g) = \mathbb{R} \setminus \{4\} \qquad \mathcal{R}(g) = (7, \infty)}$

(6c) Dang! Did that work, already! Poor organization. See A, B, C in scratch!

(7) If $p(x_1) = p(x_2)$ Then

$$5x_1 - 7 = 5x_2 - 7$$
$$\Rightarrow 5x_1 = 5x_2$$
$$\Rightarrow x_1 = x_2 \rightarrow \boxed{p \text{ is 1-to-1}}$$

(8) $\boxed{F = \dfrac{G m_1 m_2}{r^2}}$

(9)
$$|2y-4| = x$$
$$2y-4 = \pm x$$
$$2y = 4 \pm x$$
$$y = 2 \pm \tfrac{1}{2}x$$

The issue, here

So, e.g. $(2,3)$ & $(2,1)$ are pairs in the relation. not well-defined.

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Bonus

B1 $5x + h + 2 \xrightarrow{h \to 0} 5x+2 = f'(x)$

B2 $\left(\dfrac{\sqrt{x+h} - \sqrt{x}}{h}\right)\left(\dfrac{\sqrt{x+h} + \sqrt{x}}{\sqrt{x+h} + \sqrt{x}}\right)$

$$= \frac{x+h-x}{h(\sqrt{x+h}+\sqrt{x})} = \frac{1}{\sqrt{x+h}+\sqrt{x}}$$

B3 See #4

$-4 - \frac{25}{12}$

$= \frac{-48-25}{12} = -\frac{73}{12}$

B4 $3x^2 - 5x - 4$

$= 3(x^2 - \frac{5}{3}x \quad) - 4$

$= 3(x^2 - \frac{5}{3}x + (\frac{5}{6})^2 - 4 - 3(\frac{25}{36})$

$= \boxed{3(x-\frac{5}{6})^2 - \frac{73}{12}}$ $(h,k) = (\frac{5}{6}, -\frac{73}{12})$

(121) PT #2

B5

$$h(x) = \begin{cases} \sqrt{x+20} & \text{if } x < 1 \\ x^2 - 13x + 22 & \text{if } x \geq 1 \end{cases}$$