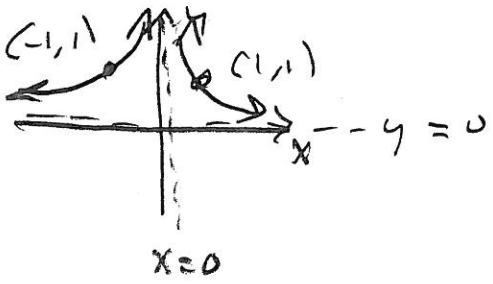
12.1

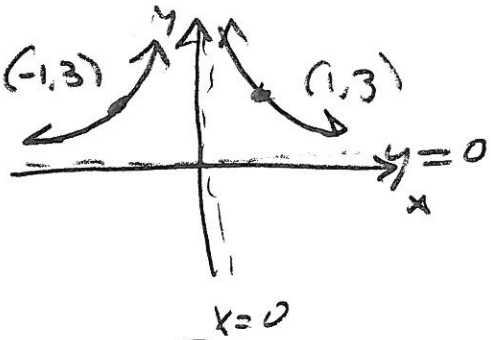
Writing Project #2
Spring, 2020

(1) $g(x) = \frac{3}{(5x-15)^2} - 6$

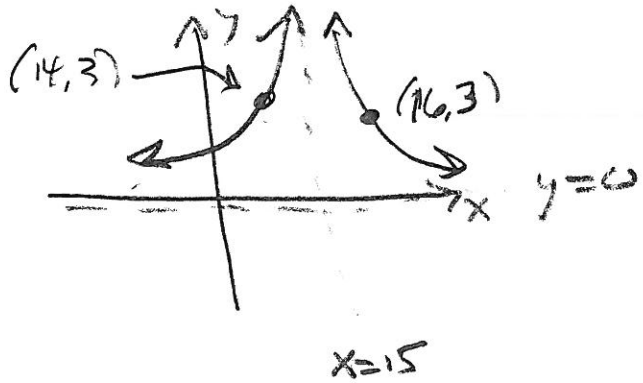
(0) $f(x) = \frac{1}{x^2}$



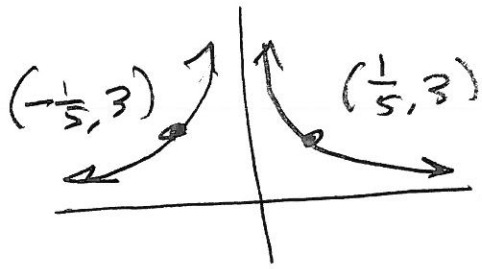
(1) $3f(x) = \frac{3}{x^2}$



(2) (M1) $3f(x-15) = \frac{3}{(x-15)^2}$



(M2) $3f(5x) = \frac{3}{(5x)^2}$

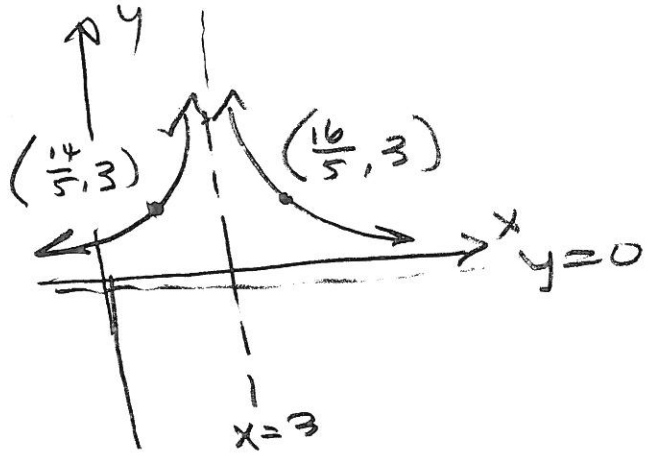


(3) $3f(5x-15) \overset{M1}{=} 3f(5(x-3)) \overset{M2}{=}$

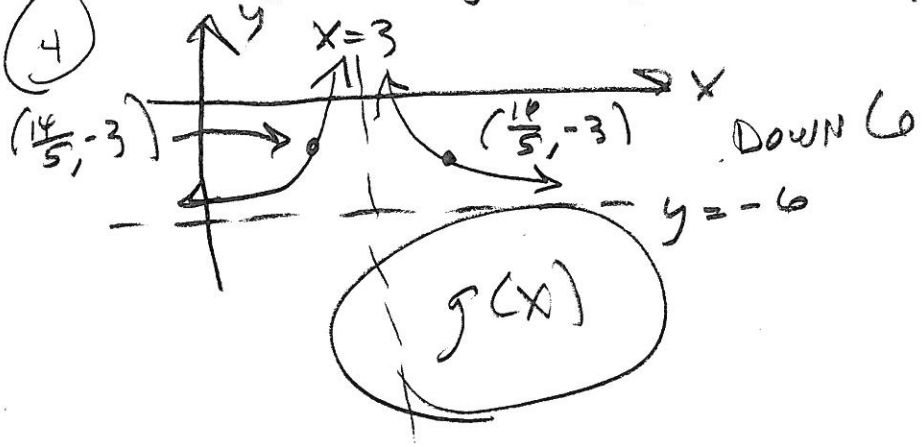
$x \mapsto \frac{1}{5}x$ $\qquad$ $x \mapsto x+3$

(M1) $14 \mapsto \frac{14}{5}$ $\qquad$ (M2) $-\frac{1}{5}+3 = \frac{14}{5}$

$16 \mapsto \frac{16}{5}$ $\qquad$ $\frac{1}{5}+3 = \frac{16}{5}$



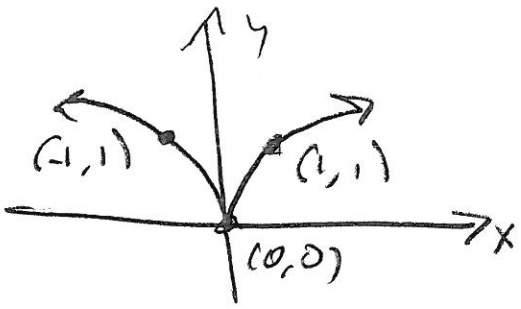
(4)



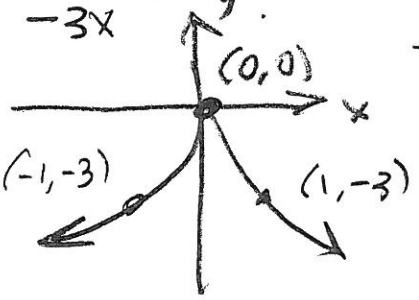
WP 2

(2) $g(x) = -3(7x-35)^{4/7} + 4$

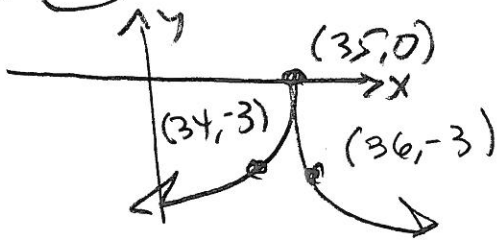
(0) $f(x) = x^{4/7}$



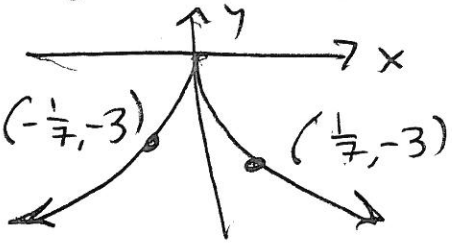
(1) $-3x^{4/7}$ $-3f(x)$



(2) (M1) $-3f(x-35)$



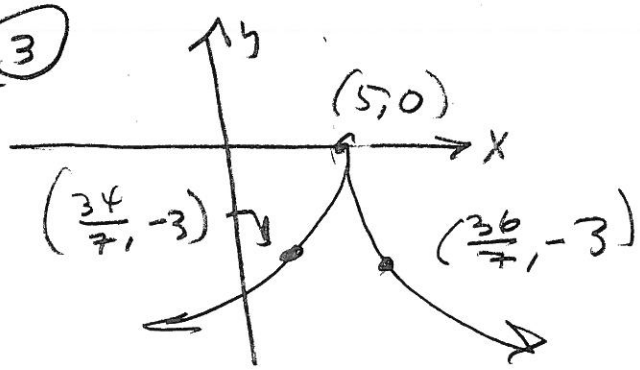
(M2) $-3f(7x)$



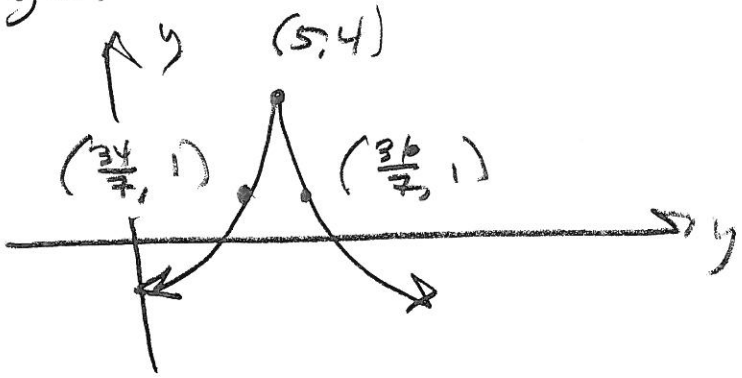
(3) $-3f(7x-35) = -3f(7(x-5))$

$x \mapsto \frac{1}{7}x$ $\quad$ $x \mapsto x+5$

(3)

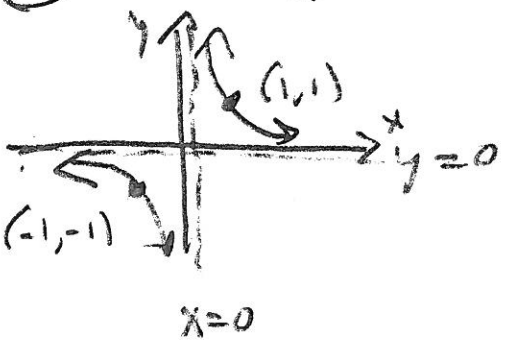


(4) $g(x)$ up 4

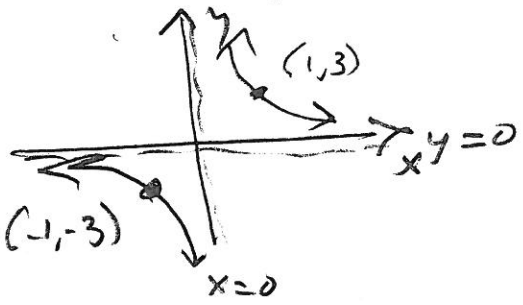


(3) $g(x) = \frac{3}{(5x-15)^3} - 6$ $f(x) = \frac{1}{x^3}$ has $\frac{1}{x}$ shape.

(0) $f(x) = \frac{1}{x^3}$

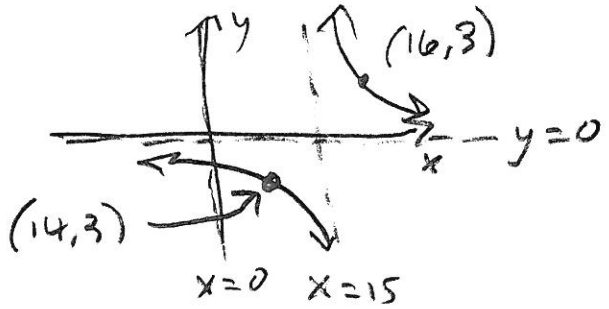


(1) $3f(x) = \frac{3}{x^3}$



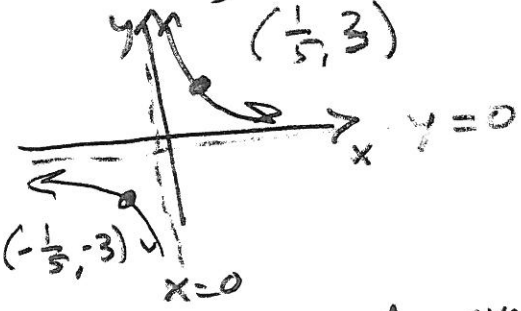
(2) (M1) $3f(x-15)$

$x \mapsto x+15$



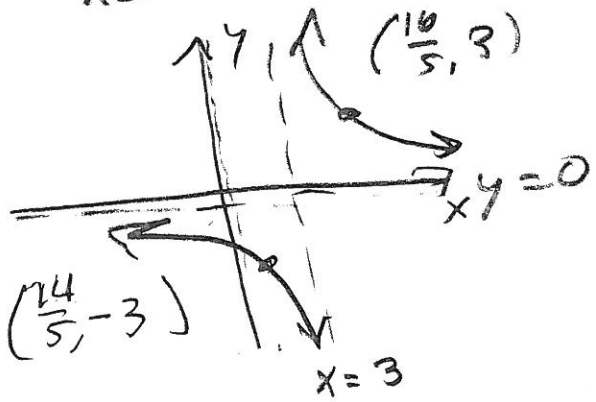
(M2) $3f(5x)$

$x \mapsto \frac{1}{5}x$

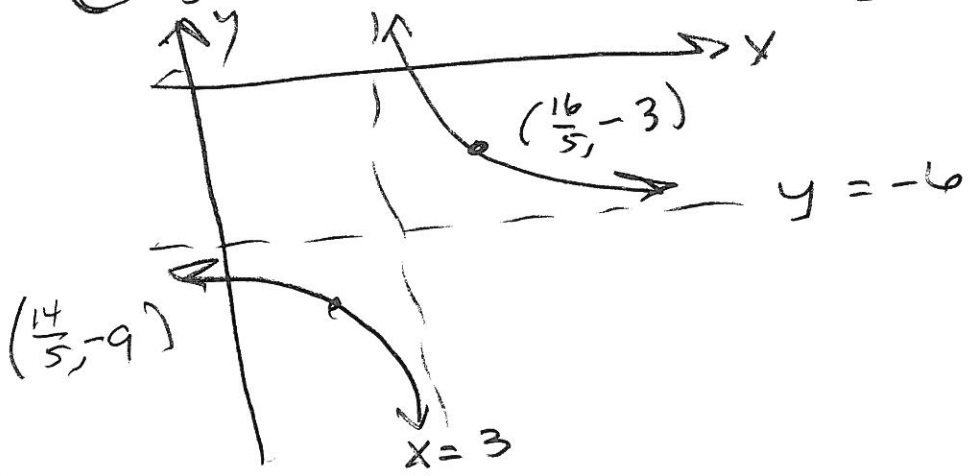


(3) $3f(5x-15) = 3f(5(x-3))$

M1: $x \mapsto \frac{1}{5}x$ M2: $x \mapsto x+3$



(4) $g(x)$ $y \mapsto y-6$

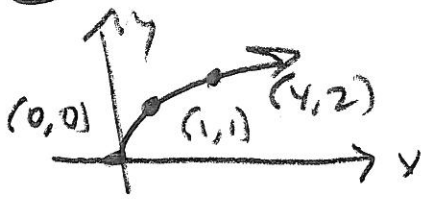


WP 2

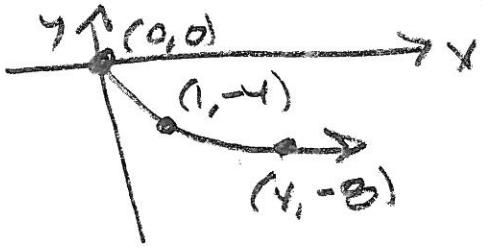
(4) $g(x) = -4\sqrt{-3x-27} + 12$ $\quad f(x) = \sqrt{x}$ shape.

(4)

① $f(x) = \sqrt{x}$

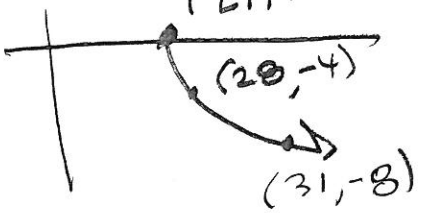


① $-4f(x) = -4\sqrt{x}$ $\quad y \mapsto -4y$



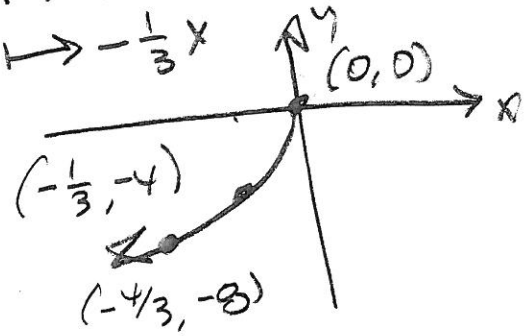
2 M1 $-4f(x-27)$

$x \mapsto x+27$



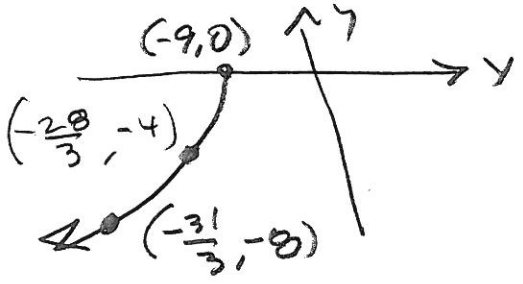
M2 $-4f(-3x) = -4\sqrt{-3x}$

$x \mapsto -\frac{1}{3}x$



③ $-4f(-3x-27) = -4f(-3(x+9))$

M1 $x \mapsto -\frac{1}{3}x$ $\quad$ M2 $x \mapsto x-9$

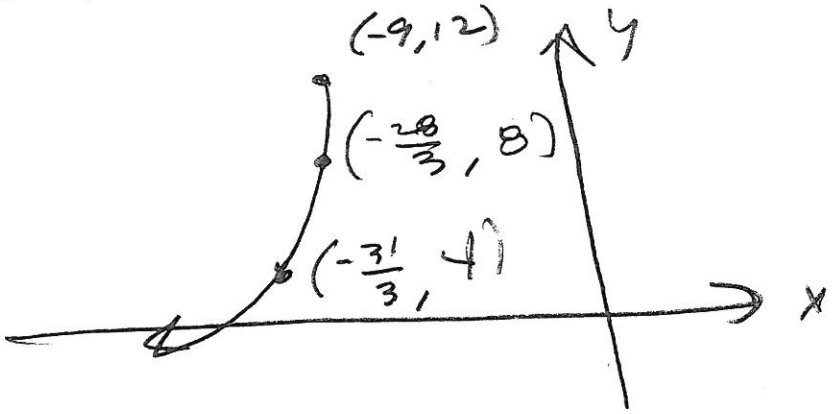


M1: $0-9=-9$

$-\frac{1}{3}-9=-\frac{28}{3}$

$-\frac{4}{3}-9=-\frac{31}{3}$

④ $g(x) = -4f(-3(x+9)) + 12$



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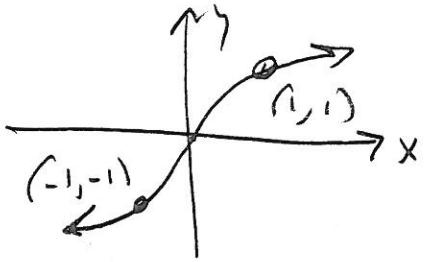
WP #2

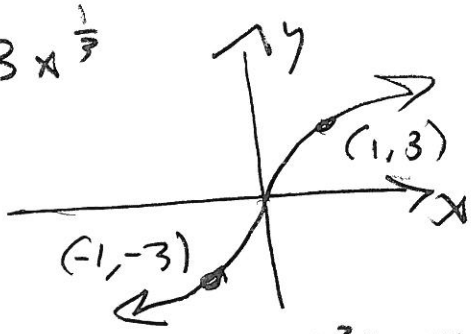
(5)

(5) $g(x) = 3\sqrt[3]{2x-30} - 11$ $\quad f(x) = \sqrt[3]{x}$

(0) $f(x) = \sqrt[3]{x} = x^{\frac{1}{3}}$

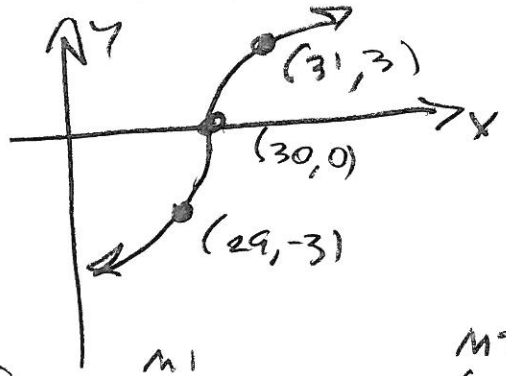


(1) $3f(x) = 3x^{\frac{1}{3}}$



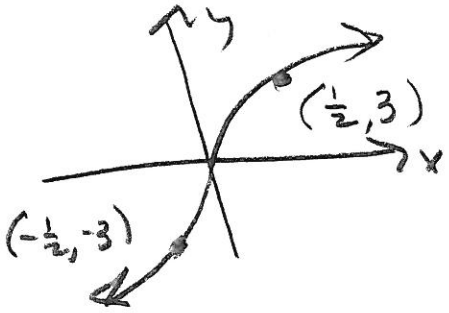
(2) (M1) $3f(x-30) = 3\sqrt[3]{x-30}$

$x \longmapsto x+30$



(M2) $3f(2x) = 3\sqrt[3]{2x}$

$x \longmapsto \frac{1}{2}x$



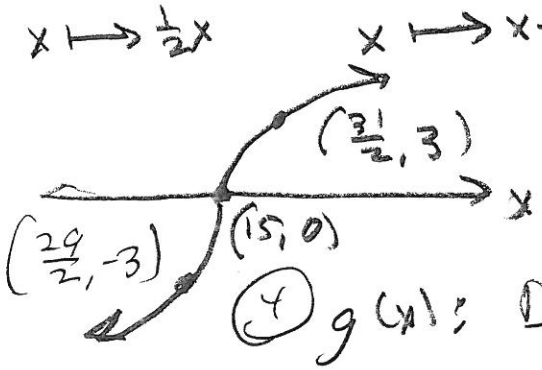
(3) $3f(2x-30) = 3f(2(x-15))$

M1 $\quad$ M2

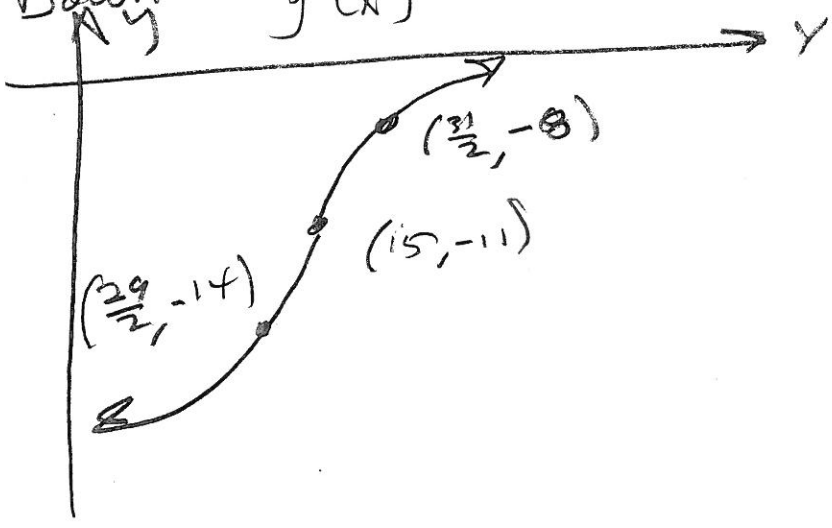
$x \longmapsto \frac{1}{2}x$ $\quad x \longmapsto x+15$

M2: $-\frac{1}{2}+15 = \frac{-1+30}{2} = \frac{29}{2}$

$\frac{1}{2}+15 = \frac{31}{2}$

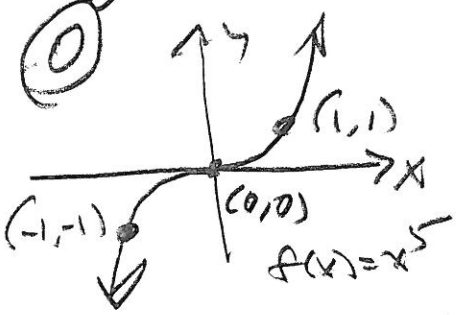


(4) $g(x)$: Down 11 $\quad g(x)$

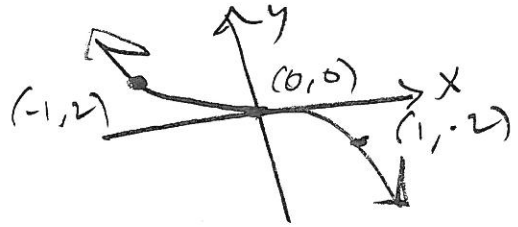


(6) $g(x) = -2(3x-12)^5 + 9$ $f(x) = x^5$ has x^3 shape.

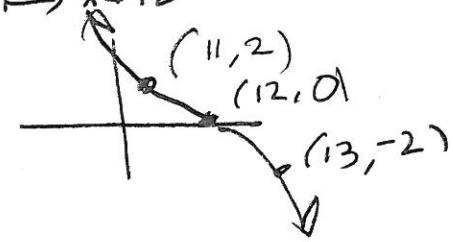
(0)



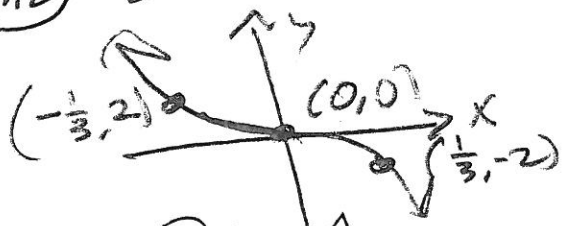
(1) $-2f(x) = -2x^5$



(2) $-2f(x-12)$ (M1) $x \longmapsto x+12$

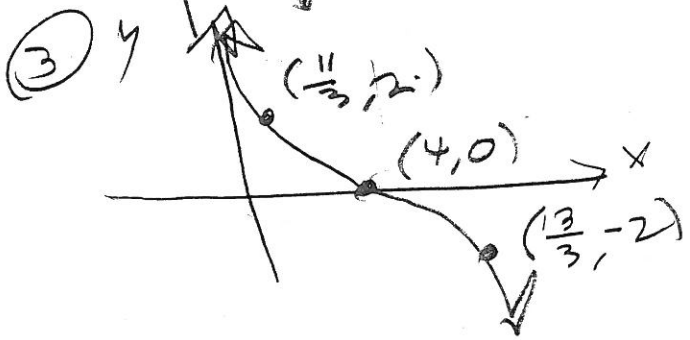


(M2) $-2f(3x)$ $x \longmapsto \frac{1}{3}x$

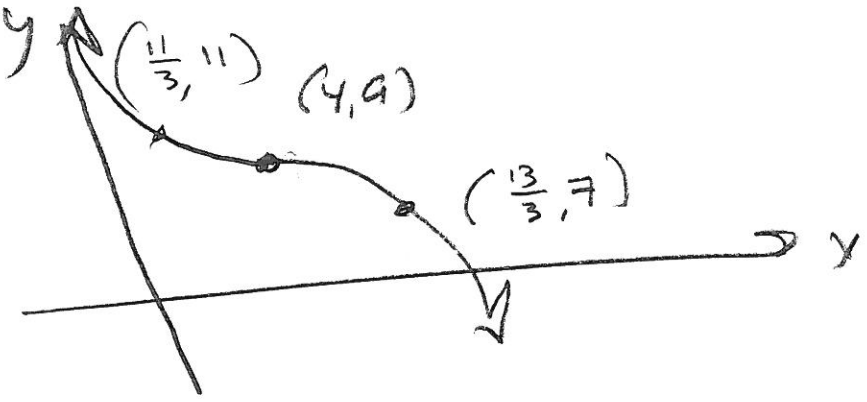


(3) $-2f(3x-12) = -2f(3(x-4))$

M1: $x \longmapsto \frac{1}{3}x$ M2: $x \longmapsto x+4$



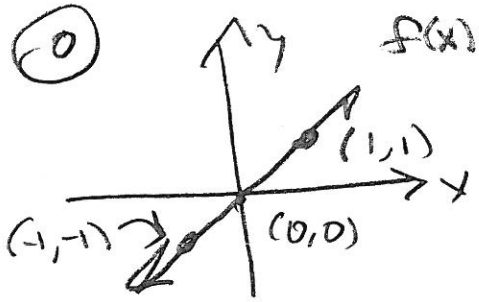
(4) $g(x)$ HP 9



12.1 WP2 (7)

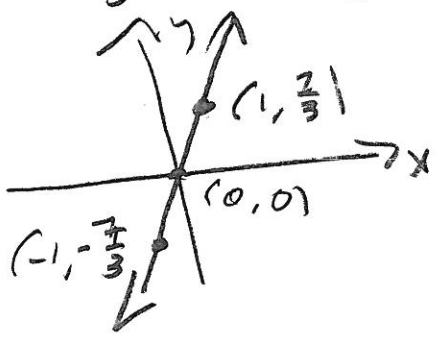
(7) $g(x) = \frac{7}{3}(x-5) - 3$

(0) $f(x) = x$



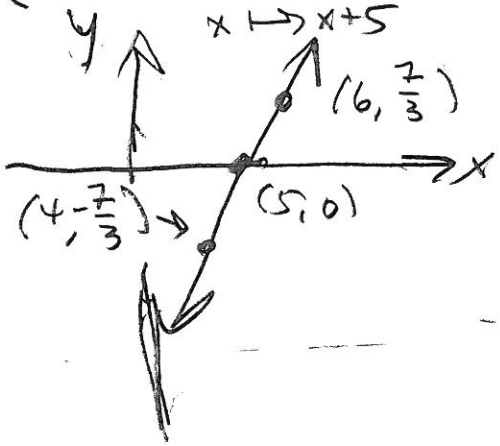
(1) $\frac{7}{3}f(x) = \frac{7}{3}x$

$y \mapsto \frac{7}{3}y$



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

$x \mapsto x+5$

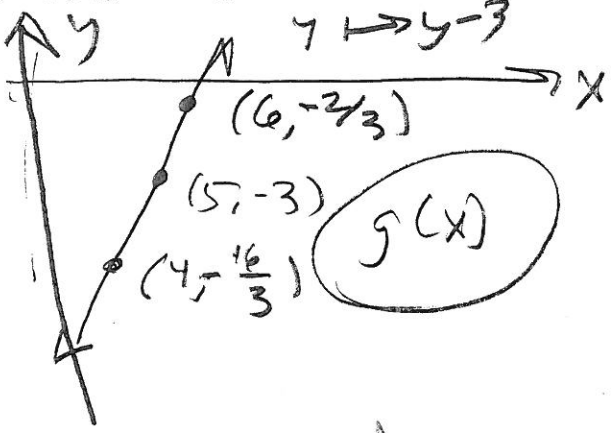


$\frac{7}{3} - \frac{9}{3} = -\frac{2}{3}$

$\frac{-7-9}{3} = \frac{-16}{3}$

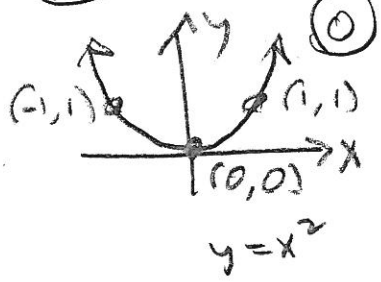
(3) $\frac{7}{3}f(x-5) - 3$ DOWN 3

$y \mapsto y-3$

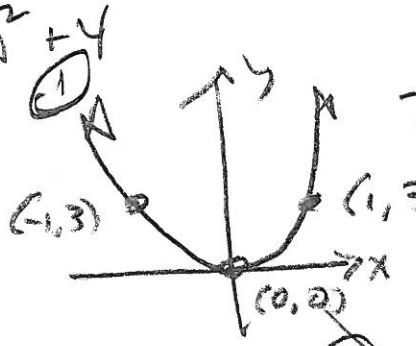


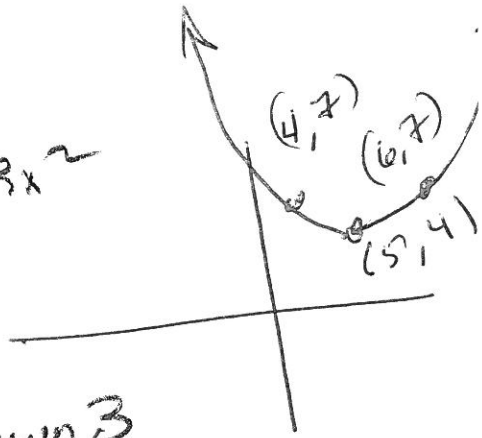
(8) $g(x) = 3(x-5)^2 + 4$

(0) $y = x^2$

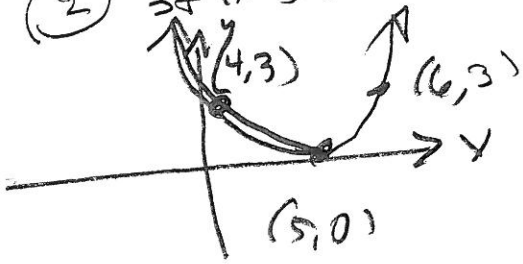


(1) $3f(x) = 3x^2$

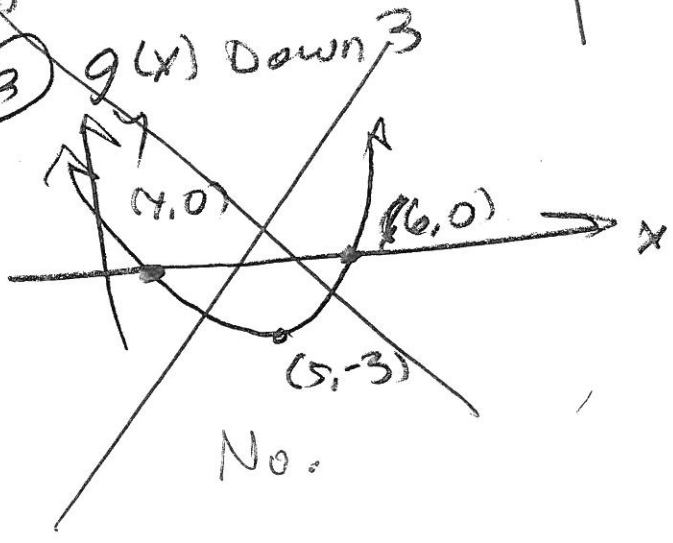




(2) $3f(x-5) = 3(x-5)^2$



(3) $g(x)$ DOWN 3

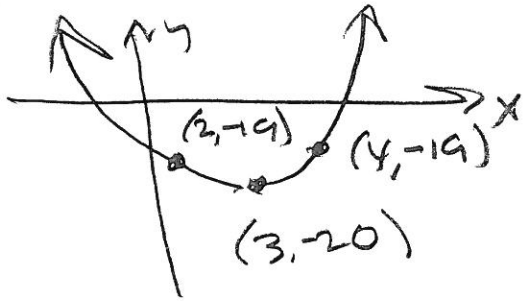


No.

121 WP2

(8)

(9) $g(x) = x^2 - 6x - 11 = x^2 - 6x + 3^2 - 9 - 11 = (x-3)^2 - 20$



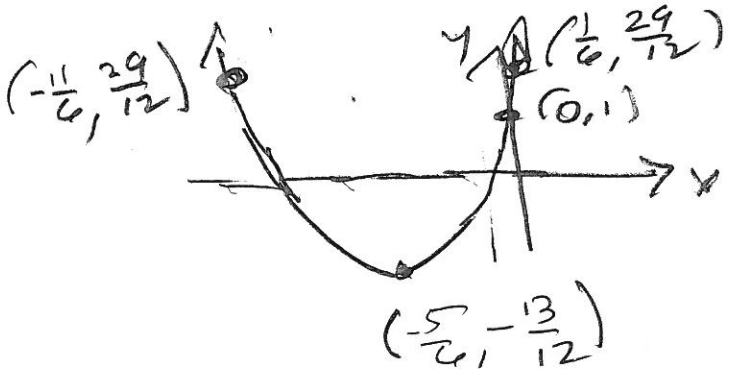
(10) $g(x) = 3x^2 + 5x + 1$

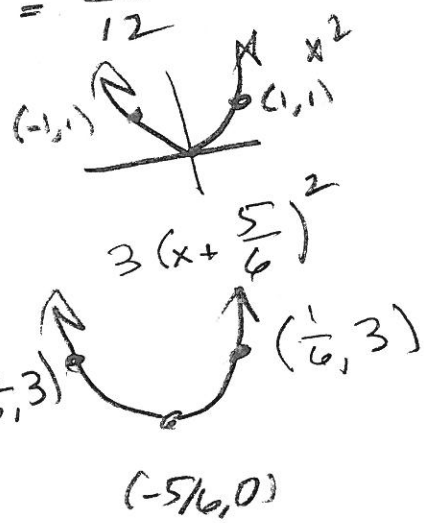
$= 3(x^2 + \frac{5}{3}x \quad) + 1$

$= 3(x^2 + \frac{5}{3}x + (\frac{5}{6})^2) + 1 - 3(\frac{25}{36})$

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

$1 - 3(\frac{25}{36}) = 1 - \frac{25}{12} = \frac{12-25}{12} = \frac{-13}{12}$





$3 - \frac{13}{12} = \frac{36-13}{12} = \frac{29}{12}$

TEST 2 Spring, 2020

$= \{(1,3), (2,7), (1,5), (3,-2)\}$

1 (5 pts) NO. (1,3) & (1,5) pair $x=1$ w/ 2 y-vals.

(5 pts) $D(f) = \{1,2,3\}$

(5 pts) $R(f) = \{3,7,5,-2\}$

c (5 pts) f isn't a function $\Rightarrow$

d (5 pts) f isn't a function.

f isn't a 1-to-1 function.

2 $f(x) = \sqrt{-x+2}$, $g(x) = \frac{x+9}{x+5}$

c (5 pts) $\frac{f}{g} = \frac{\sqrt{-x+2}}{\left(\frac{x+9}{x+5}\right)}$

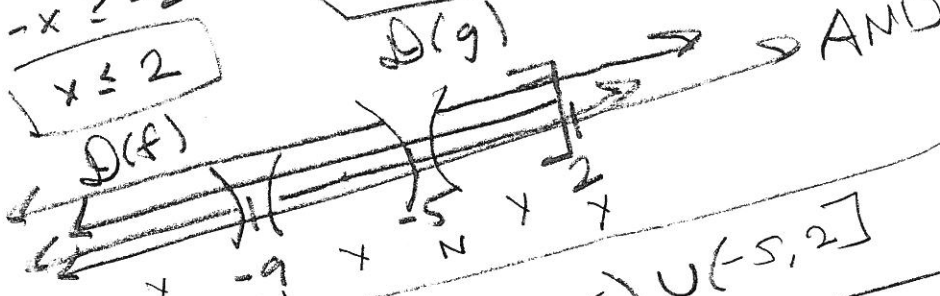
b (5 pts) $D\left(\frac{f}{g}\right) = \{x \mid -x+2 \geq 0 \text{ and } x+5 \neq 0 \text{ and } x+9 \neq 0\}$

$-x+2 \geq 0$

$-x \geq -2$

$\boxed{x \leq 2}$ and $\boxed{x+5 \neq 0}$ $\boxed{x \neq -5}$ and $\boxed{x+9 \neq 0}$ $\boxed{x \neq -9}$

$g(x) \neq 0$



$= \boxed{(-\infty,-9) \cup (-9,-5) \cup (-5,2]} = D\left(\frac{f}{g}\right)$

12.1 T2 (5)

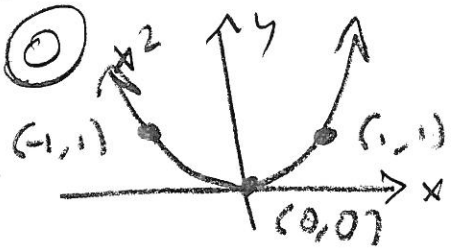
6b (5pts) $D(g) = [3, \infty)$

$R(g) = (-\infty, -5]$

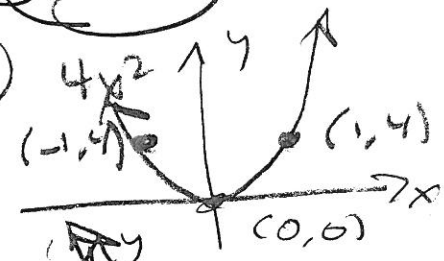
6c (5pts) No x- or y-intercepts!

7 $r(x) = 4(x-2)^2 - 11$ (10pts)

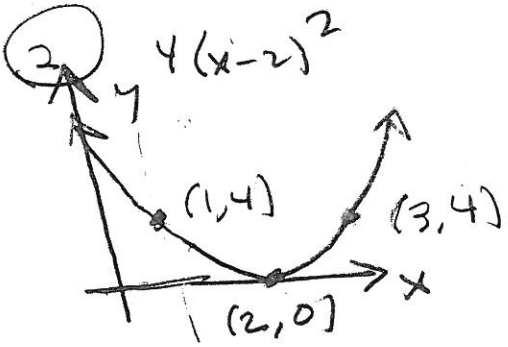
0) x^2



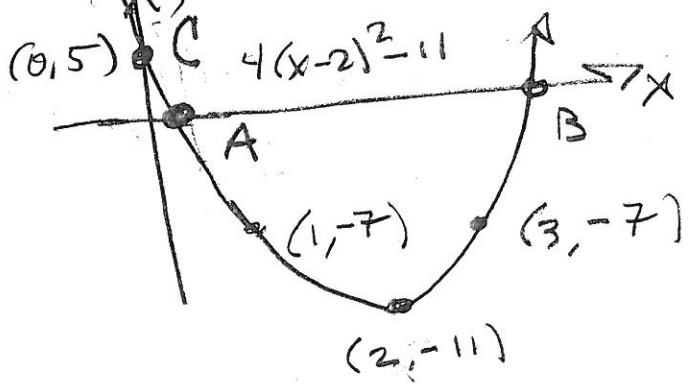
1) $4x^2$



2) $4(x-2)^2$



C) $4(x-2)^2 - 11$



b) $4(x-2)^2 - 11 = 0$

$4(x-2)^2 = 11$

$(x-2)^2 = \frac{11}{4}$

$x - 2 = \pm \frac{\sqrt{11}}{2}$

$x = 2 \pm \frac{\sqrt{11}}{2}$

$A = (2 - \frac{\sqrt{11}}{2}, 0)$, $B = (2 + \frac{\sqrt{11}}{2}, 0)$

.3416876048 3.658312395

$g(0) = 4(0-2)^2 - 11$

$= 4(-2)^2 - 11$

$= 4(4) - 11$

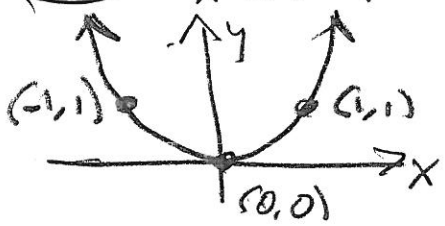
$= 16 - 11 = 5$

$C = (0, 5)$

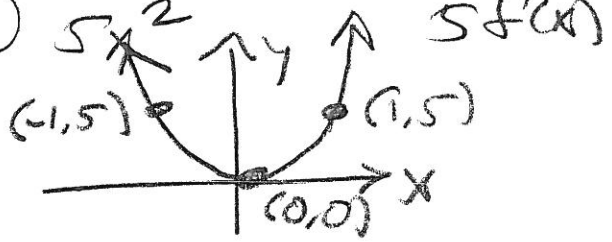
121 T2 (X)

(7) $r(x) = 5(x-2)^2 - 9$ version.

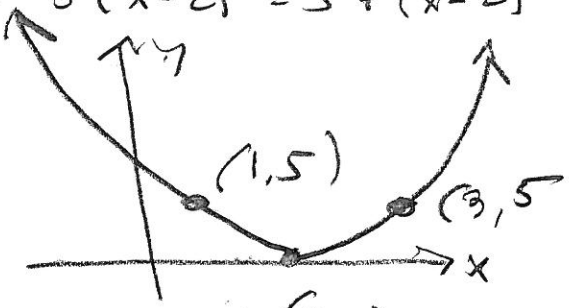
(0) $x^2 = f(x)$



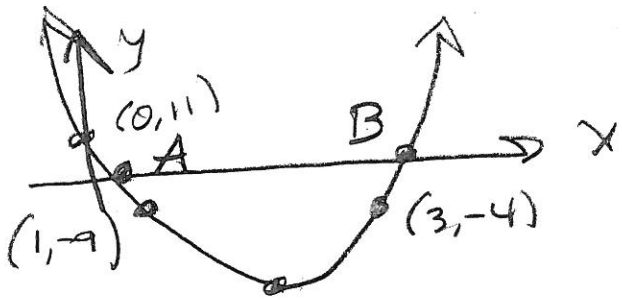
(1) $5x^2$ $5f(x)$



(2) $5(x-2)^2 = 5f(x-2)$



(3)



$r(0) = 5(-2)^2 - 9 = 20 - 9 = 11$ Also (7b)

(0,11) y-int

$5(x-2)^2 - 9 = 0$

$5(x-2)^2 = 9$

$(x-2)^2 = \frac{9}{5}$

$x - 2 = \pm\sqrt{\frac{9}{5}} = \pm\frac{3}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \pm\frac{3\sqrt{5}}{5}$

$x = 2 \pm \frac{3\sqrt{5}}{5}$ OR $\frac{10 \pm 3\sqrt{5}}{5}$

(7b) (5pts)

$A = (2 - \frac{3\sqrt{5}}{5}, 0)$, $B = (2 + \frac{3\sqrt{5}}{5}, 0)$

x-intercepts

8 (10pts) $f(x) = \frac{x-6}{x+6}$ is 1-to-1.

Proof

Suppose $f(x_1) = f(x_2)$. Then

$$\frac{x_1-6}{x_1+6} = \frac{x_2-6}{x_2+6} \longrightarrow LCD = (x_1+6)(x_2+6)$$

$$\Rightarrow \frac{(x_1-6)(x_2+6)}{LCD} = \frac{(x_2-6)(x_1+6)}{LCD} \Rightarrow$$

$$x_1x_2 + 6x_1 - 6x_2 - 36 = x_2x_1 + 6x_2 - 6x_1 - 36$$

$$\Rightarrow 12x_1 = 12x_2$$

$$\Rightarrow x_1 = x_2 \Rightarrow f \text{ is 1-to-1}$$

#1 (5pts) $f(x) = \sqrt{x} \Rightarrow \frac{f(x+h)-f(x)}{h} =$

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

$h \to 0$

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

$$\frac{1}{\sqrt{x}+\sqrt{x}} = \boxed{\frac{1}{2\sqrt{x}}}$$

#9 (10pts) $\boxed{y = k\frac{x^3\sqrt{z}}{4}}$

B2 Spb $h(x) = 7x^2 - 3x + 2$

$= 7\left(x^2 - \frac{3}{7}x\right) + 2$

$= 7\left(x^2 - \frac{3}{7}x + \left(\frac{3}{14}\right)^2\right) + 2 - 7\left(\frac{9}{196}\right)$

$= \boxed{7\left(x - \frac{3}{14}\right)^2 + \frac{47}{28}}$

Scratch 28

$\frac{2}{1} \cdot \frac{28}{28} - \frac{9}{28} = \frac{56-9}{28} = \frac{47}{28}$

B3 Spb $r(x) = \frac{x-3}{x^2-5x+5} \Rightarrow$

$\mathcal{D}(r) = \{x \mid x^2 - 5x + 5 \neq 0\}$

$x^2 - 5x + \left(\frac{5}{2}\right)^2 - \frac{25}{4} + 5 \neq 0$

$\left(x - \frac{5}{2}\right)^2 + \frac{25+20}{4} \neq 0$

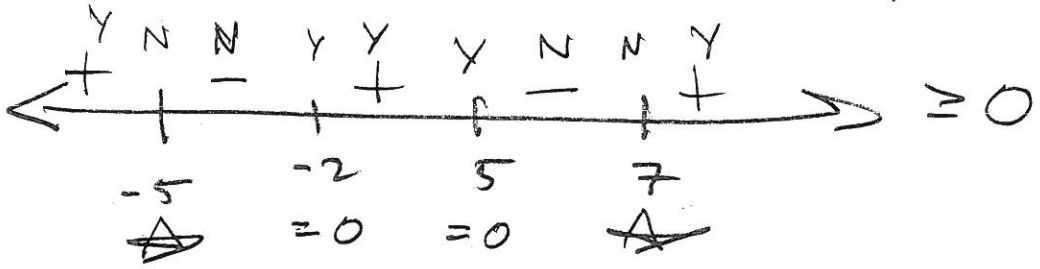
$\left(x - \frac{5}{2}\right)^2 \neq \frac{5}{4}$

$x - \frac{5}{2} \neq \pm \frac{\sqrt{5}}{2}$

$x \neq \frac{5 \pm \sqrt{5}}{2} \Rightarrow \mathcal{D}(r) = \boxed{\mathbb{R} \setminus \left\{\frac{5 \pm \sqrt{5}}{2}\right\}}$

$= \boxed{(-\infty, \frac{-5-\sqrt{5}}{2}) \cup (\frac{-5-\sqrt{2}}{2}, \frac{-5+\sqrt{2}}{2}) \cup (\frac{-5+\sqrt{5}}{2}, \infty)}$

B5 5pts $\dfrac{(x+2)(x-5)}{(x-7)(x+5)} \geq 0 \Rightarrow x \in$ $-5, -2, 5, 7$



$= \boxed{(-\infty, -5) \cup [-2, 5] \cup (7, \infty)}$

$= \{x \mid x < -5 \text{ OR } -2 \leq x \leq 5 \text{ OR } x > 7\}$

B4 5pts $-\sqrt{10-5x} + 7 = y$

$-\sqrt{10-5x} = y - 7$

$\sqrt{10-5x} = 7 - y$

$10 - 5x = (7-y)^2 = (y-7)^2$

$-5x = (y-7)^2 - 10$

$x = -\frac{1}{5}(y-7)^2 + 2$

$\boxed{f^{-1}(x) = -\frac{1}{5}(x-7)^2 + 2}$