p.197 #39 $f(x) = |x|$, $g(x) = 2x+3$

$$f(g(x)) = f(2x+3) = |2x+3|$$

$$g(f(x)) = g(|x|) = 2|x| + 3$$

$$f(f(x)) = f(|x|) = ||x|| = |x|$$

$$g(g(x)) = g(2x+3) = 2(2x+3) + 3$$

$$= 4x + 9$$

outer

inner

#49. $f(g(x)) = (x-9)^5$

$f(x) = x^5$ $\quad$ $g(x) = x-9$

#51 $f(g(x)) = \dfrac{x^2}{x^2+4}$

$f(x) = \dfrac{x}{x+4}$ $\quad$ $g(x) = x^2$

#50 $y = \dfrac{2x-1}{x-3}$

inverse: $x = \dfrac{2y-1}{y-3}$

$$x(y-3) = 2y-1$$

$$xy - 3x = 2y - 1$$

$$xy - 2y = 3x - 1$$

$$y(x-2) = 3x-1$$

$$\boxed{f^{-1}(x) = y = \dfrac{3x-1}{x-2}}$$

$f(4) = 7$

$(4, 7)$

$f^{-1}(7) = \dfrac{3(7)-1}{7-2}$

$= \dfrac{20}{5} = 4$

$(7, 4)$

#41. $f(x) = 5 - 4x^3$

inverse: $x = 5 - 4y^3$

$$x - 5 = -4y^3$$

$$\frac{x-5}{-4} = y^3$$

$$\sqrt[3]{\frac{x-5}{-4}} = y = \left(\frac{x-5}{-4}\right)^{1/3}$$

or $f^{-1}(x) = \sqrt[3]{\dfrac{5-x}{4}}$

#47. $f(x) = \frac{2x+5}{x-7}$

inverse: $x = \frac{2y+5}{y-7}$

$x(y-7) = 2y+5$

$xy - 7x = 2y + 5$

$xy - 2y = 7x + 5$

$y(x-2) = 7x + 5$

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

$f(8) = 21$

$(8, 21)$

$f^{-1}(21) = \frac{\overset{147}{7(21)}+5}{21-2}$

$= \frac{152}{19} = 8$

$$\begin{array}{r} {}^{7}19 \\ \times\ 8 \\ \hline 152 \end{array}$$

#13 $f(g(2)) = f(-5) = -1$

$g(2) = -5$

option 1 : Review prob today

Tuesday 9 - 12 TEST

option 2 : Review prob. today

Tuesday 9-12 Answer questions

start chapter 3

Thursday 9-14 TEST

Test Review

(1) (a) $1000^{-4/3} = 10^{-4} = \dfrac{1}{10000}$

(b) $\left(\dfrac{49}{121}\right)^{\frac{1}{2}} = \dfrac{7}{11}$

(c) $\left(\dfrac{64a^3}{125b^6}\right)^{-\frac{1}{3}} = \left(\dfrac{4a}{5b^2}\right)^{-1} = \dfrac{5b^2}{4a}$

(d) $\left(\dfrac{64c^8}{81d^{12}}\right)^{\frac{3}{4}} = \left(\dfrac{\sqrt{8}\,c^2}{3d^3}\right)^3 = \dfrac{8\overset{2\sqrt{2}}{\sqrt{8}}c^6}{27d^9} = \dfrac{16\sqrt{2}\,c^6}{27d^9}$

(2) (a) $(a^3b^{-2})^5(ab^4)^{-4} = a^{15}b^{-10}a^{-4}b^{-16}$

$= a^{11}b^{-26} = \dfrac{a^{11}}{b^{26}}$

(b) $\dfrac{4x^3y^{-2}}{(5xy^{-3})^3} \cdot \dfrac{25x^{-4}}{(12y^{-1})^2} = \dfrac{\cancel{4}\cancel{x^3}\cancel{y^{-2}}}{\underset{5}{\cancel{125}}\cancel{x^3}y^{-9}} \cdot \dfrac{\cancel{25}x^{-4}}{\underset{36}{\cancel{144}}\cancel{y^{-2}}}$

$= \dfrac{y^9}{180x^4}$

(2c) $$\frac{(2x^{-3}y^{5})^3}{(x^{-2})^4} \cdot \frac{(x^4 y^{-3})^{-2}}{(4y^{-1})^2}$$

$$= \frac{\cancel{8}x^{-9}y^{15}}{\cancel{x^{-8}}} \cdot \frac{\cancel{x^{-8}}y^6}{\cancel{16}_{2}\,y^{-2}} = \frac{y^{23}}{2x^9}$$

(4)

ⓐ $$\frac{x^2-2x+1}{x^2+2x-3} \cdot \frac{x^2+7x+12}{x^2-6x+5}$$

$$= \frac{\cancel{(x-1)}\cancel{(x-1)}}{\cancel{(x+3)}\cancel{(x-1)}} \cdot \frac{\cancel{(x+3)}(x+4)}{(x-5)\cancel{(x-1)}} = \frac{x+4}{x-5},$$

$x \neq 1, -3, 5$

ⓑ $$\frac{2x^2-5x-3}{3x^2+5x+2} \cdot \frac{3x^2-x-2}{2x^2+7x+3}$$

$$= \frac{\cancel{(2x+1)}(x-3)}{\cancel{(3x+2)}(x+1)} \cdot \frac{\cancel{(3x+2)}(x-1)}{\cancel{(2x+1)}(x+3)}$$

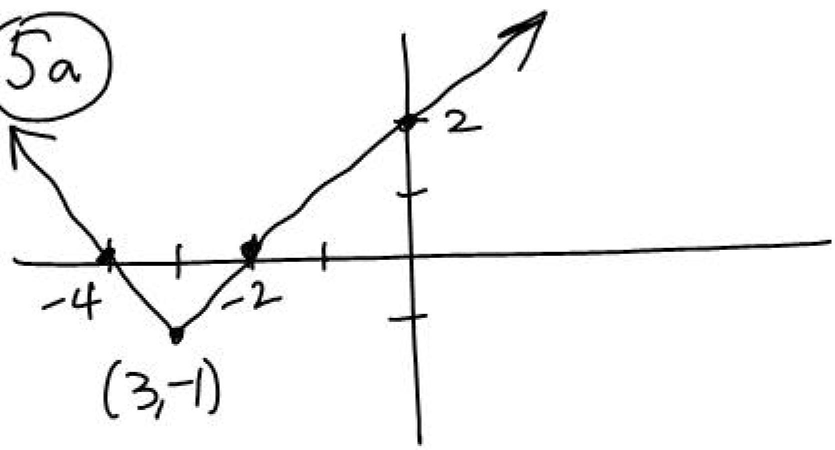
$$= \frac{(x-3)(x-1)}{(x+1)(x+3)}, \quad x \neq -\frac{2}{3}, -\frac{1}{2}, -1, -3$$

4c $4 - \dfrac{2x}{3x+2}$

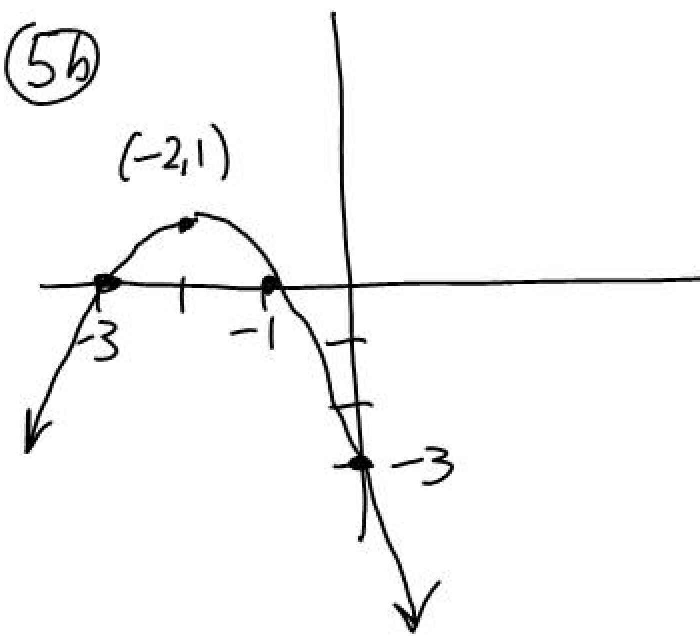
$$\frac{4(3x+2)}{3x+2} - \frac{2x}{3x+2}$$

$$= \frac{12x+8-2x}{3x+2} = \frac{10x+8}{3x+2}$$

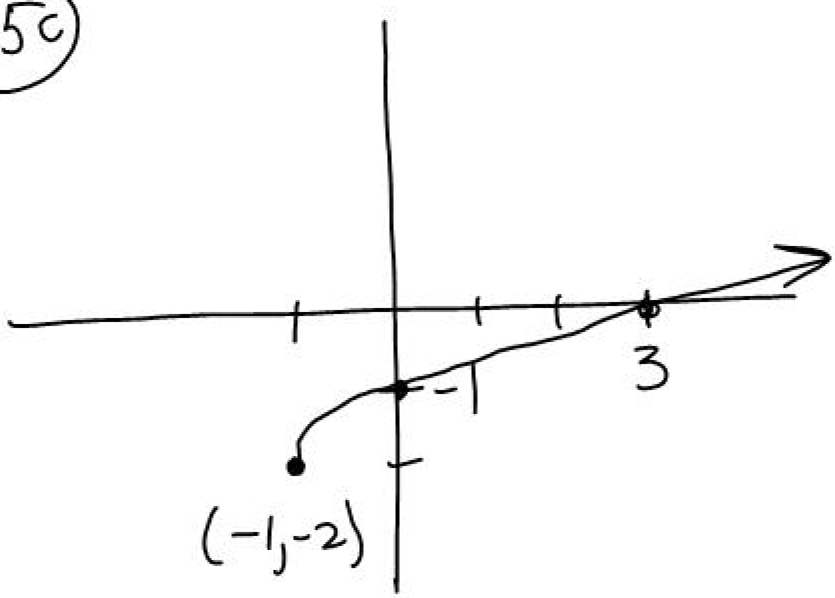
5a



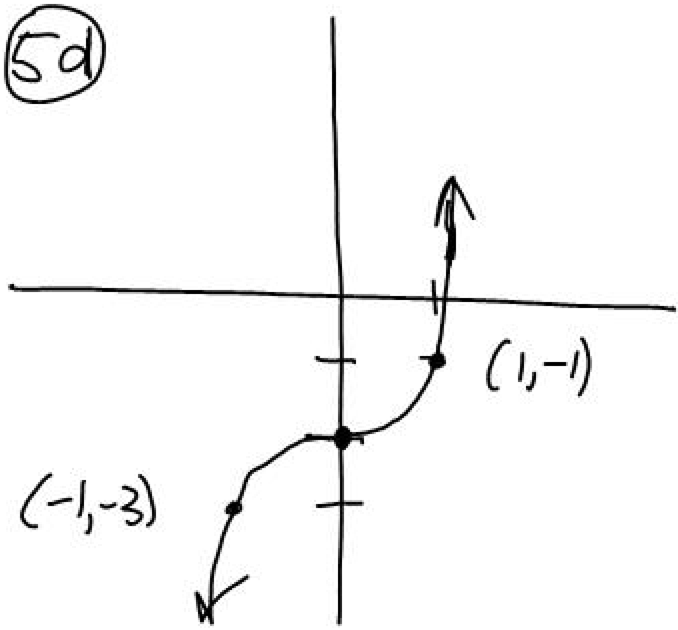
5b



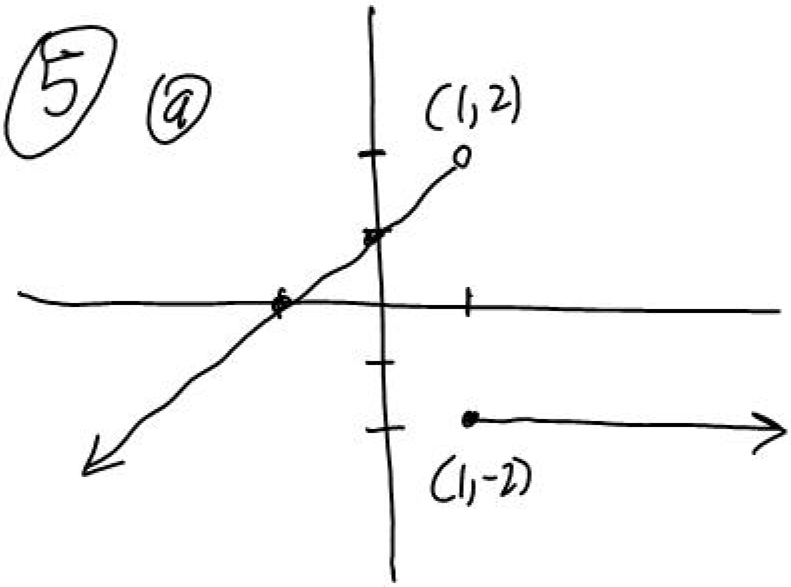
5c



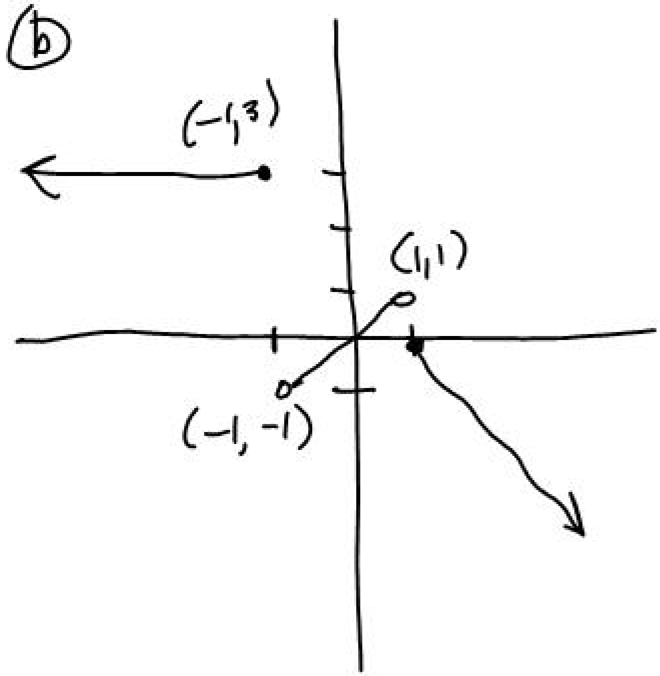
5d



5 (a)



(b)



6 (a) $(0,\infty)$

(b) $x^2-9\neq 0$

$(x+3)(x-3)\neq 0$

$x\neq\pm 3$

$\mathbb{R}-\{\pm 3\}$

(c) $x^2+x-20\geq 0$

$(x+5)(x-4)\geq 0$

$(-\infty,-5]\cup[4,\infty)$

(d) $\mathbb{R}$ (you can take the cube root of any number, positive, negative, or zero)

7 (a) D: $[-6,3]$

R: $[-2,7]$

(b) D: $[-4,4]$

R: $[-2,5]$

8. (a) $f(g(x)) = f(3x+5) = (3x+5)^2 + 3(3x+5)$

$= 9x^2 + 30x + 25 + 9x + 15$

$= 9x^2 + 39x + 40$

(b) $g(f(x)) = g(x^2+3x) = 3(x^2+3x) + 5$

$= 3x^2 + 9x + 5$

(c) $g(g(x)) = g(3x+5) = 3(3x+5) + 5 = 9x + 20$

(d) $f(f(2)) = f(2^2 + 3(2)) = f(10) = 10^2 + 3(10) = 130$

9. (a) $x = 4y - 5$

$x + 5 = 4y$

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

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

(b) $x = \frac{2y-5}{4y+1}$

$x(4y+1) = 2y - 5$

$4xy + x = 2y - 5$

$4xy - 2y = -x - 5$

$y(4x-2) = -x - 5$

$y = \frac{-x-5}{4x-2}$

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

(c) $x = y^3 + 1$

$x - 1 = y^3$

$\sqrt[3]{x-1} = y$

$\boxed{f^{-1}(x) = \sqrt[3]{x-1}}$

(10) (a) $\dfrac{f(4)-f(-2)}{4-(-2)} = \dfrac{4^2-(-2)^2}{6} = \dfrac{12}{6} = 2$

(b) $\dfrac{f(3)-f(1)}{3-1} = \dfrac{(3^2+2(3)+\cancel{2})-(1^2+2(1)+\cancel{2})}{2} = 6$

(c) $\dfrac{f(a+h)-f(a)}{(a+h)-a} = \dfrac{(a+h)^2-a^2}{h} = \dfrac{\cancel{a^2}+2ah+h^2-\cancel{a^2}}{h}$

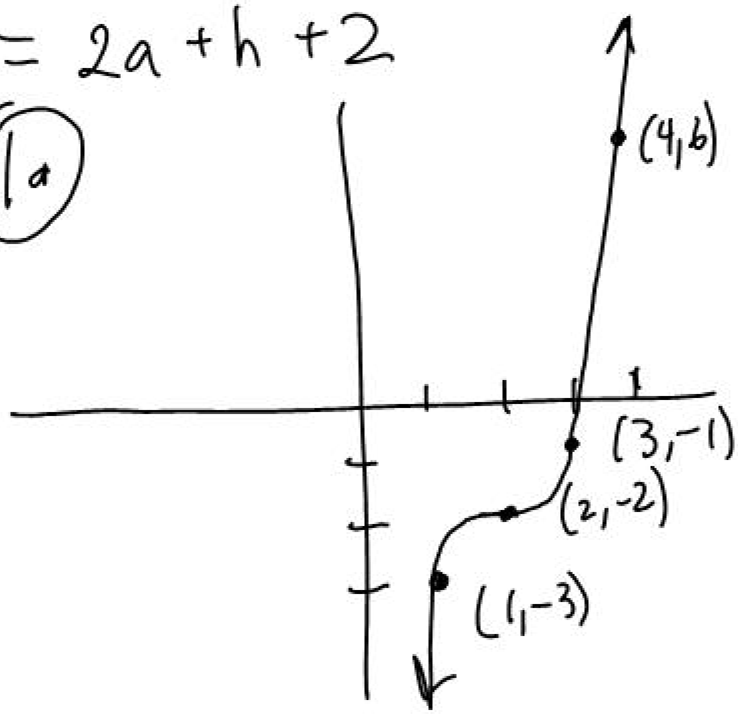
$= \dfrac{\cancel{h}(2a+h)}{\cancel{h}} = 2a+h$

(d) $\dfrac{f(a+h)-f(a)}{(a+h)-a} = \dfrac{[(a+h)^2+2(a+h)+\cancel{2}]-[a^2+2a+\cancel{2}]}{h}$

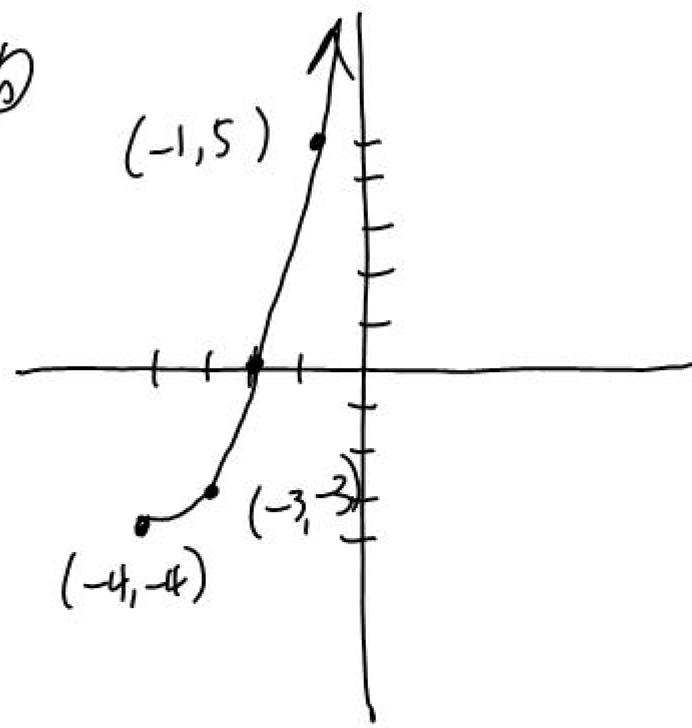
$= \dfrac{\cancel{a^2}+2ah+h^2+\cancel{2a}+2h-\cancel{a^2}-\cancel{2a}}{h} = \dfrac{\cancel{h}(2a+h+2)}{\cancel{h}}$

$= 2a+h+2$

(11a)



(b)



12. (a) and (b) are one-to-one (graph with the calculator + do the horizontal line test.)

13. (a) $f(g(2)) = f(-5) = -1$

(b) $f(g(-3)) = f(0) = 2$

(c) $g(f(-3)) = g(1) = -4$

(d) $g(f(6)) = g(-1) = -2$

(e) $f(f(4)) = f(1) = 2$

(f) $g(g(0)) = g(-3) = 0$

(g) $g(g(g(4))) = g(g(-3)) = g(0) = -3$