1a. $4x^2y^4\sqrt[3]{144x^5y^7}$

$4x^2y^4\sqrt[3]{2\cdot2\cdot2\cdot2\cdot3\cdot3\cdot x^5\cdot y^7}$

$4x^2y^4\cdot 2xy^2\sqrt[3]{18x^2y}$

$\boxed{8x^3y^6\sqrt[3]{18x^2y}}$

2a. $\sqrt[4]{2250x^5y}\cdot\sqrt[4]{540xy^3}$

$\sqrt[4]{2\cdot3\cdot3\cdot5\cdot5\cdot5\cdot2\cdot2\cdot3\cdot3\cdot3\cdot5\cdot x^6y^4}$

$3\cdot5xy\sqrt[4]{24x^2}$

$\boxed{15xy\sqrt[4]{24x^2}}$

2b. $\sqrt[3]{\dfrac{2250x^5y}{540xy^3}} = \dfrac{\sqrt[3]{2\cdot3\cdot3\cdot5\cdot5\cdot\cancel{5}\cdot\cancel{x}\cdot x\cdot x\cdot x\cdot x\cdot y}}{\sqrt[3]{2\cdot2\cdot3\cdot3\cdot3\cdot\cancel{5}\cdot\cancel{x}\cdot y\cdot y\cdot y}}$

$\dfrac{\sqrt[3]{2\cdot3\cdot3\cdot5\cdot5\cdot x\cdot x\cdot x\cdot x\cdot y}}{3y\sqrt[3]{2\cdot2}}\cdot\dfrac{\sqrt[3]{2}}{\sqrt[3]{2}}$

$\dfrac{\sqrt[3]{2\cdot2\cdot3\cdot3\cdot5\cdot5\cdot x\cdot x\cdot x\cdot x\cdot y}}{6y}$

$\boxed{\dfrac{x\sqrt[3]{900xy}}{6y}}$

2c. $\sqrt[3]{16} \cdot \sqrt[4]{64}$

$\sqrt[3]{2^4} \cdot \sqrt[4]{2^6}$

$2\sqrt[3]{2} \cdot 2\sqrt[4]{2^2}$

$4(2^{\frac{1}{3}})(2^{\frac{2}{4}})$

$4(2^{\frac{1}{3}})(2^{\frac{1}{2}})$

$4(2^{\frac{2}{6}})(2^{\frac{3}{6}})$

$4(2^{5/6})$

$4\sqrt[6]{2^5}$

$\boxed{4\sqrt[6]{32}}$

3a. $\sqrt[3]{40x^4} - \sqrt[3]{27x} + 3\sqrt[3]{8x}$

$\sqrt[3]{2 \cdot 2 \cdot 2 \cdot 5 \cdot x^4} = 2x\sqrt[3]{5x}$

$\sqrt[3]{3 \cdot 3 \cdot 3 \cdot x} = 3\sqrt[3]{x}$

$3\sqrt[3]{2 \cdot 2 \cdot 2 \cdot x} = 6\sqrt[3]{x}$

$2x\sqrt[3]{5x} - 3\sqrt[3]{x} + 6\sqrt[3]{x}$

$2x\sqrt[3]{5x} + 3\sqrt[3]{x}$

3a. $\sqrt{12x} - \sqrt{9x} + \sqrt{27x}$

$2\sqrt{3x} - 3\sqrt{x} + 3\sqrt{3x}$

$\boxed{5\sqrt{3x} - 3\sqrt{x}}$

4a. $6\sqrt{5-c} - 7 = 11$

$6\sqrt{5-c} = 18$

$\sqrt{5-c} = 3$

$5 - c = 9$

$-c = 4$

$\boxed{c = -4}$ $\quad 6\sqrt{5 - -4} - 7 = 11$ ✓

4b. $\sqrt{15x+10} = 2x+3$

$15x + 10 = 4x^2 + 12x + 9$

$0 = 4x^2 - 3x - 1$

$0 = (4x+1)(x-1)$ $\quad \sqrt{15(-\frac{1}{4})+10} = 2(-\frac{1}{4})+3$ ✓

$\boxed{x = -\frac{1}{4}, 1}$ $\quad \sqrt{15(1)+10} = 2(1)+3$ ✓

4c. $\sqrt{-x-1} = x+1$

$-x-1 = x^2 + 2x + 1$

$0 = x^2 + 3x + 2$

$0 = (x+2)(x+1)$ $\quad \sqrt{--1-1} = -1+1$ ✓

$\boxed{x = -1, \cancel{-2}}$ $\quad \sqrt{--2-1} \neq -2+1$

4d. $\sqrt[3]{5x+2} = -4$

$5x + 2 = -64$

$5x = -66$

$\boxed{x = -\frac{66}{5}}$ $\quad \sqrt[3]{5(-13.2)+2} = -4$ ✓

4e. $-2|x-5|+1=-5$

$-2|x-5|=-6$

$|x-5|=3$

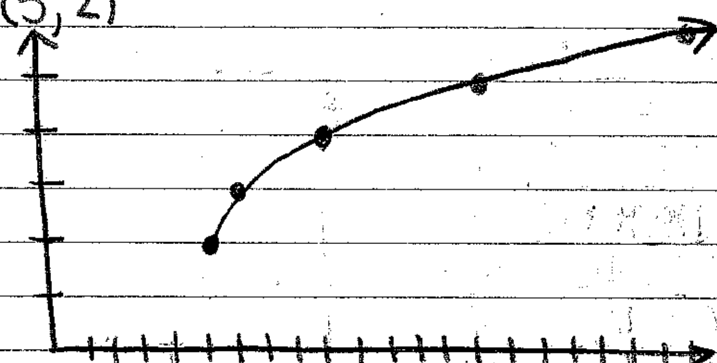
$x-5=3$ $\qquad$ $x-5=-3$

$\boxed{x=8 \qquad x=2}$

5a. $f(x)=\sqrt{x-5}+2$

vertex: $(5,2)$

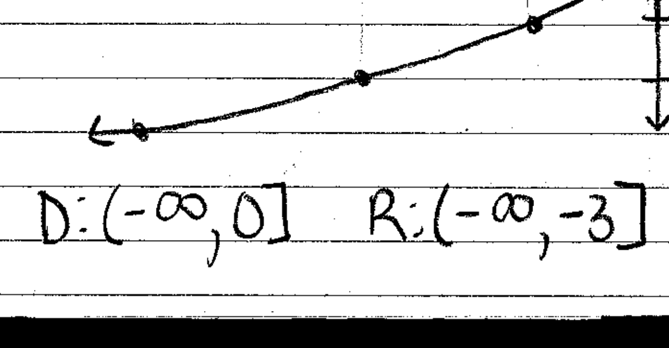
x	y
5	2
6	3
9	4
14	5
21	6



D: $[5, \infty)$ $\quad$ R: $[2, \infty)$

5b. $f(x)=-\sqrt{-x}-3$ $\quad$ vertex: $(0,-3)$

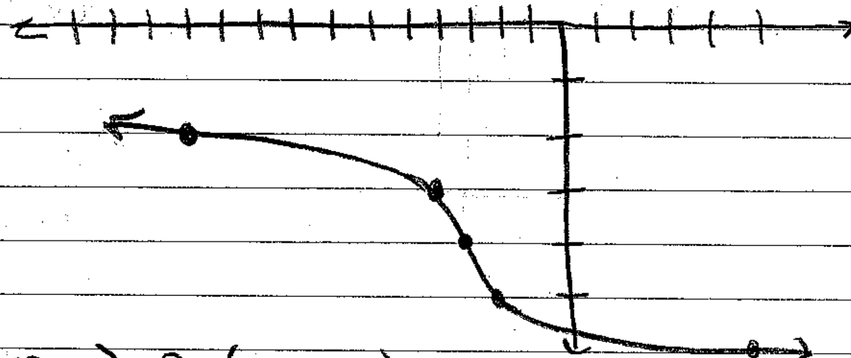
x	y
0	-3
-1	-4
-4	-5
-9	-6
-16	-7



D: $(-\infty, 0]$ $\quad$ R: $(-\infty, -3]$

5c $-\sqrt[3]{x+3}-4$ $(-3,-4)$

x	y
-11	-2
-4	-3
-3	-4
-2	-5
5	-6



D: $(-\infty,\infty)$ R: $(-\infty,\infty)$

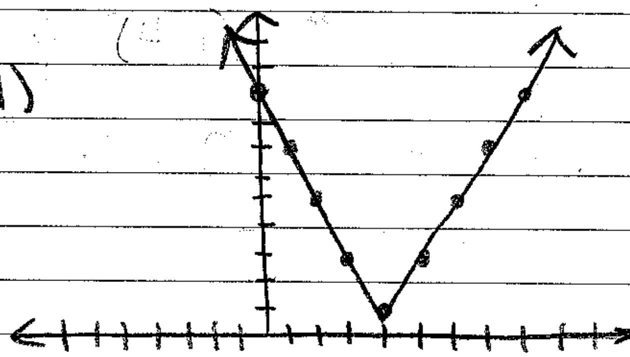
5d $2|x-4|+1$

vertex: $(4,1)$

$m=\pm 2$

D: $(-\infty,\infty)$

R: $[1,\infty)$



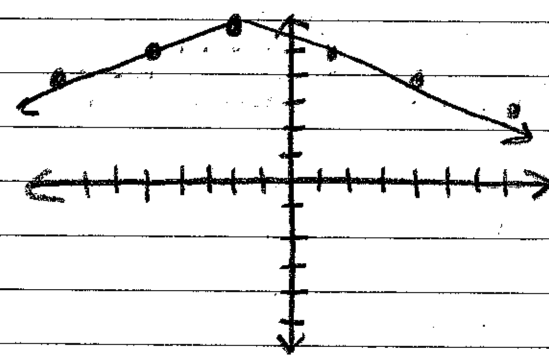
5e $-\frac{1}{3}|x+2|+6$

vertex: $(-2,6)$

$m=\pm\frac{1}{3}$

D: $(-\infty,\infty)$

R: $(-\infty,6]$

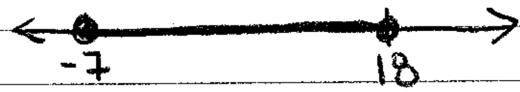


6a. $\sqrt{x+7} - 8 \leq -3$ $\qquad$ $x+7 \geq 0$

$\sqrt{x+7} \leq 5$ $\qquad$ $x \geq -7$

$x+7 \leq 25$

$x \leq 18$



$\boxed{\begin{matrix} -7 \leq x \leq 18 \\ \text{or} \\ [-7, 18] \end{matrix}}$

6b. $3|x-1| \geq -6$

$|x-1| \geq -2$

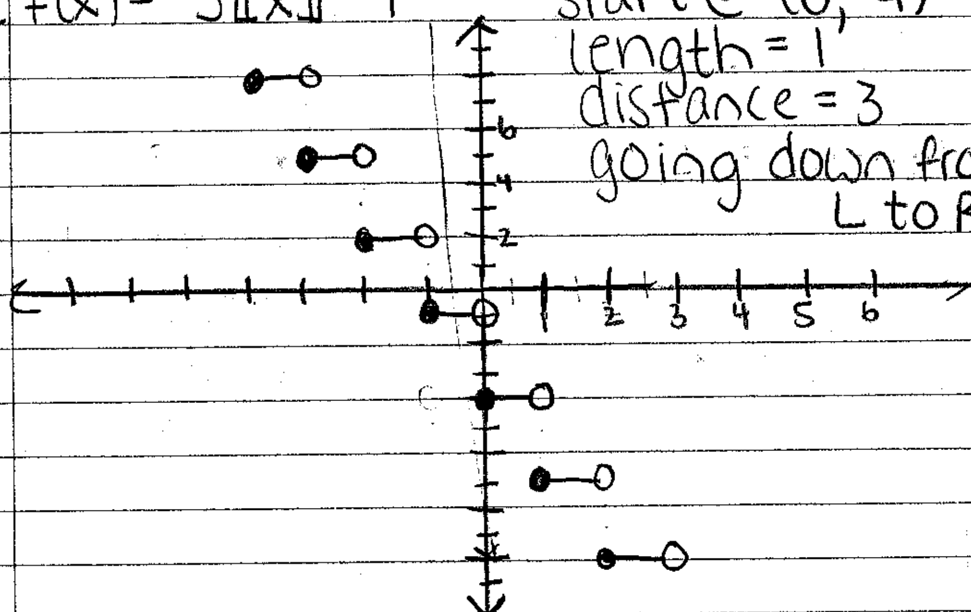
$\boxed{(-\infty, \infty)}$

7a. $[\![3.7]\!] = 3$ $\quad$ $[\![0.8]\!] = 0$ $\quad$ $[\![-2.9]\!] = -3$

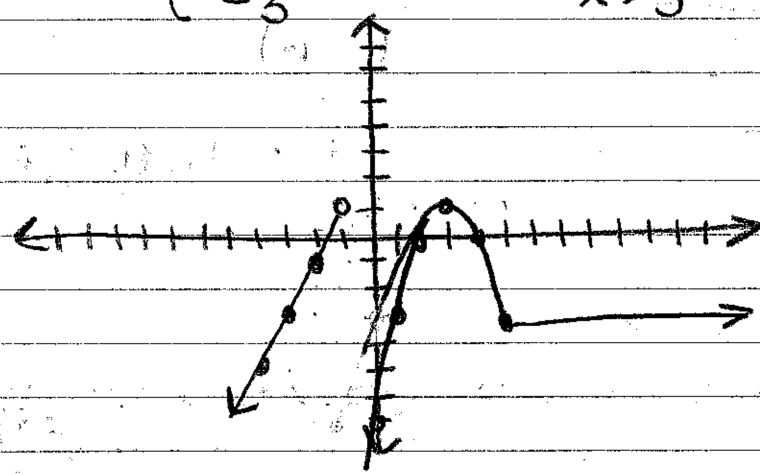
$[\![\pi]\!] = 3$ $\quad$ $[\![\sqrt{5}]\!] = -3$

7b. $f(x) = -3[\![x]\!] - 4$

start @ $(0,-4)$
length = 1
distance = 3
going down from L to R



8a. $f(x) = \begin{cases} 2x+3 & x<-1 \\ -(x-3)^2+1 & -1 \le x \le 5 \\ -3 & x>5 \end{cases}$



b. $f(-2) = -1$ $f(2) = 0$ $f(7) = -3$
$f(-1) = -15$ $f(5) = -3$

8c. $g(x) = \begin{cases} -\frac{3}{2}x - 4 & x<-4 \\ -2(x+2)^2+10 & -4 \le x \le 1 \\ \sqrt{x-1}+1 & x>1 \end{cases}$

9. $f(g(x$ … $= \frac{3}{\left(\frac{3}{x-2}+4\right)-4} + 2$

$\frac{3}{\frac{3}{x-2}} + 2$

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

$x-2+2$

x

$f(g(x$ … nd $g(x)$

ar…

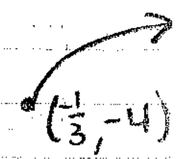
see next page

9. $f(g(x)) = \frac{1}{2}\sqrt{(4x^2-2)+2}$
$= \frac{1}{2}\sqrt{4x^2}$
$= \frac{1}{2}(2x)$
$= x$

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

$f(g(x)) = g(f(x)) = x$, so $f(x)$ and $g(x)$ are inverses

10a. $m(x) = 5\sqrt{3x+1} - 4$ D: $[-\frac{1}{3}, \infty)$
$= 5\sqrt{3(x+\frac{1}{3})} - 4$ R: $[-4, \infty)$



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

$\boxed{m^{-1}(x) = \frac{1}{3}\left(\frac{1}{5}(x+4)\right)^2 - \frac{1}{3} \quad x \geq -4}$ $\boxed{D: [-4, \infty) \quad R: [-\frac{1}{3}, \infty)}$

10b. $f(x) = -\frac{1}{3}\sqrt[3]{x-4} + 2$ D: $(-\infty, \infty)$ R: $(-\infty, \infty)$

$x = -\frac{1}{3}\sqrt[3]{y-4} + 2$
$x-2 = -\frac{1}{3}\sqrt[3]{y-4}$
$-3(x-2) = \sqrt[3]{y-4}$
$(-3(x-2))^3 = y-4$

$\boxed{f^{-1}(x) = (-3(x-2))^3 + 4}$ $\boxed{D: (-\infty, \infty) \quad R: (-\infty, \infty)}$

10c. $j(x) = -\sqrt{-\frac{1}{3}x - 2} + 7$ $\quad$ D: $(-\infty, -6]$

$= -\sqrt{-\frac{1}{3}(x+6)} + 7$ $\quad$ R: $(-\infty, 7]$ $\quad$ $(-6, 7)$

$x = -\sqrt{-\frac{1}{3}(y+6)} + 7$

$x - 7 = -\sqrt{-\frac{1}{3}(y+6)}$

$-1(x-7) = \sqrt{-\frac{1}{3}(y+6)}$

$(-(x-7))^2 = -\frac{1}{3}(y+6)$

$-3(-(x-7))^2 = y + 6$

$\boxed{j^{-1}(x) = -3(-(x-7))^2 - 6 \quad x \leq 7}$ $\boxed{D: (-\infty, 7] \quad R: (-\infty, -6]}$

11. a. $g(x) = \frac{1}{4}|x-8| + 6$

$m = \frac{1}{4} \cdot |1| = \frac{1}{4}$ $(x_1, y_1) = (8, 6)$

left

$y - 6 = -\frac{1}{4}(x-8)$

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

$y = -\frac{1}{4}x + 8$

right

$y - 6 = \frac{1}{4}(x-8)$

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

$y = \frac{1}{4}x + 4$

$$\boxed{g(x) = \begin{cases} -\frac{1}{4}x + 8 & \text{if } x < 8 \\ \frac{1}{4}x + 4 & \text{if } x \geq 8 \end{cases}}$$

b. $f(x) = -5\left|\frac{1}{3}x + 2\right| - 1 = -5\left|\frac{1}{3}(x+6)\right| - 1$

$m = -5 \cdot \left|\frac{1}{3}\right| = -\frac{5}{3}$ $(x_1, y_1) = (-6, -1)$

left

$y + 1 = \frac{5}{3}(x+6)$

$y = \frac{5}{3}x + 10 - 1$

$y = \frac{5}{3}x + 9$

right

$y + 1 = -\frac{5}{3}(x+6)$

$y = -\frac{5}{3}x - 10 - 1$

$y = -\frac{5}{3}x - 11$

$$\boxed{f(x) = \begin{cases} \frac{5}{3}x + 9 & \text{if } x < -6 \\ -\frac{5}{3}x - 11 & \text{if } x \geq -6 \end{cases}}$$

c. $j(x) = -\frac{2}{5}|-3x-9| = -\frac{2}{5}|-3(x+3)|$

$m = -\frac{2}{5} \cdot |-3| = -\frac{6}{5}$ $(x_1, y_1) = (-3, 0)$

left

$y = \frac{6}{5}(x+3)$

$= \frac{6}{5}x + \frac{18}{5}$

right

$y = -\frac{6}{5}(x+3)$

$y = -\frac{6}{5}x - \frac{18}{5}$

$$\boxed{j(x) = \begin{cases} \frac{6}{5}x + \frac{18}{5} & \text{if } x < -3 \\ -\frac{6}{5}x - \frac{18}{5} & \text{if } x \geq -3 \end{cases}}$$