

Solving Radical Equations

$$1. \sqrt{4x+8} + 9 = 11$$

$$\sqrt{4x+8} = 2$$

$$4x+8=4$$

$$4x = -4$$

$$x = -1$$

check ✓

$$\sqrt{4(-1)+8} + 9 = 11$$

$$\sqrt{-4+8} + 9 = 11$$

$$\sqrt{4} + 9 = 11$$

$$2 + 9 = 11 \quad \checkmark$$

11
✓

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$$2. (\sqrt{5x-7})^2 = (\sqrt{6x+2})^2$$

$$5x-7 = 6x+2$$

$$-x-7 = 2$$

$$-x = 9$$

$$x = -9$$

check ✓

$$\sqrt{5(-9)-7} = \sqrt{6(-9)+2}$$

$$\sqrt{-45-7} = \sqrt{-54+2}$$

$$\sqrt{-52} = \sqrt{-52}$$

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$$3. x - x\sqrt{7} = 3$$

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

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

↓ conjugate

$$x = \frac{3 + 3\sqrt{7}}{1 + \sqrt{7} - \sqrt{7} - 7}$$

$$x = \frac{3 + 3\sqrt{7}}{-6}$$

$$x = \frac{1 + \sqrt{7}}{-2}$$

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$$4. -2\sqrt{9x+5} - 9 = -21$$

$$\frac{-2\sqrt{9x+5}}{-2} = \frac{-12}{-2}$$

$$(\sqrt{9x+5})^2 = (6)^2$$

$$\begin{array}{r} 9x+5 = 36 \\ -5 \quad -5 \end{array}$$

$$\frac{9x}{9} = \frac{31}{9}$$

$$x = \frac{31}{9}$$

check ✓

$$-2\sqrt{9\left(\frac{31}{9}\right)+5} - 9 = -21$$

$$-2\sqrt{31+5} - 9 = -21$$

$$-2\sqrt{36} - 9 = -21$$

$$-2(6) - 9 = -21$$

$$-21 = -21 \quad \checkmark$$

||
C

Mar 17-10:56 AM

5. $\sqrt[3]{x-1} + 4 = 3$

$$\left(\sqrt[3]{x-1}\right)^3 = (-1)^3$$

$$x-1 = -1$$

$$x = 0$$

check ✓

$$\sqrt[3]{0-1} = -1$$

$$\sqrt[3]{-1} = -1 \quad \checkmark$$

$$-1 = -1 \quad \checkmark$$

||
↓

Mar 17-10:57 AM

* Keep in mind.... can't take $\sqrt{\text{of } a}$ & get a negative #

ex: $\sqrt{3x-1} = -2$

∅ no solution

* you can take $\sqrt[3]{\text{of } a}$ & get a negative #

ex: $\sqrt[3]{-8} = -2$

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AC CCGPS Geo B/Adv. Alg
Solving Radical Equations WS 1

Name Key

Solve each equation. Be sure to check for extraneous solutions.

$$1. \begin{aligned} 1+x\sqrt{2} &= 0 \\ -1 & \quad -1 \\ x\sqrt{2} &= -1 \\ \frac{x\sqrt{2}}{\sqrt{2}} &= \frac{-1}{\sqrt{2}} \\ x &= \frac{-1 \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} \\ x &= \frac{-\sqrt{2}}{2} \end{aligned}$$

$$2. \begin{aligned} 6+2x\sqrt{3} &= 0 \\ -6 & \quad -6 \\ 2x\sqrt{3} &= -6 \\ \frac{2x\sqrt{3}}{2\sqrt{3}} &= \frac{-6}{2\sqrt{3}} \\ x &= \frac{-3\sqrt{3}}{3} = -\sqrt{3} \end{aligned}$$

$$3. \begin{aligned} x\sqrt{2}+3x &= 4 \\ x(\sqrt{2}+3) &= 4 \\ \frac{x(\sqrt{2}+3)}{\sqrt{2}+3} &= \frac{4}{\sqrt{2}+3} \\ x &= \frac{4}{(\sqrt{2}+3)(\sqrt{2}-3)} \\ x &= \frac{4\sqrt{2}-12}{2-9} \\ x &= \frac{4\sqrt{2}-12}{-7} \end{aligned}$$

$$4. \begin{aligned} x-x\sqrt{5} &= 2 \\ x(1-\sqrt{5}) &= 2 \\ \frac{x(1-\sqrt{5})}{1-\sqrt{5}} &= \frac{2}{1-\sqrt{5}} \\ x &= \frac{2}{1-\sqrt{5}} \cdot \frac{(1+\sqrt{5})}{(1+\sqrt{5})} \\ x &= \frac{2(1+\sqrt{5})}{1-5} \\ x &= \frac{2(1+\sqrt{5})}{-4} \\ x &= \frac{-(1+\sqrt{5})}{2} \end{aligned}$$

$$5. \begin{aligned} \sqrt{x-4}-3 &= 0 \\ +3 & \quad +3 \\ \sqrt{x-4} &= 3 \\ x-4 &= 9 \\ x &= 13 \end{aligned}$$

$$6. \begin{aligned} \sqrt{x-5}-7 &= 0 \\ \sqrt{x-5} &= 7 \\ x-5 &= 49 \\ x &= 54 \end{aligned}$$

$$7. \begin{aligned} (\sqrt[3]{x+1})-2 &= 3 \\ \sqrt[3]{x+1} &= 5 \\ x+1 &= 125 \\ x &= 124 \end{aligned}$$

$$8. \begin{aligned} \sqrt[3]{x-1} &= 3 \\ x-1 &= 27 \\ x &= 28 \end{aligned}$$

$$9. \begin{aligned} \sqrt[4]{3x-2} &= 0 \\ \sqrt[4]{3x-2} &= 2 \\ 3x-2 &= 16 \\ 3x &= 18 \\ x &= 6 \end{aligned}$$

$$10. \begin{aligned} (\sqrt[4]{4x}) &= 3 \\ 4x &= 81 \\ x &= 20.25 \end{aligned}$$

$$11. \begin{aligned} \sqrt{2x+3}-7 &= 0 \\ \sqrt{2x+3} &= 7 \\ 2x+3 &= 49 \\ 2x &= 46 \\ x &= 23 \end{aligned}$$

$$12. \begin{aligned} \sqrt{3x-5}-3 &= 1 \\ +3 & \quad +3 \\ \sqrt{3x-5} &= 4 \\ (\sqrt{3x-5})^2 &= (4)^2 \\ 3x-5 &= 16 \\ 3x &= 21 \\ x &= 7 \end{aligned}$$

$$13. \begin{aligned} \sqrt{4x+8}+9 &= 11 \\ \sqrt{4x+8} &= 2 \\ 4x+8 &= 4 \\ 4x &= -4 \\ x &= -1 \end{aligned}$$

$$14. \begin{aligned} \sqrt{1+2x}-6 &= -3 \\ \sqrt{1+2x} &= 3 \\ 1+2x &= 9 \\ 2x &= 8 \\ x &= 4 \end{aligned}$$

$$15. \begin{aligned} \sqrt{5x+1}+6 &= 10 \\ \sqrt{5x+1} &= 4 \\ 5x+1 &= 16 \\ 5x &= 15 \\ x &= 3 \end{aligned}$$

$$16. \sqrt[3]{2x+3}+5=4$$

~~16~~

$$17. \begin{aligned} \sqrt{3x+1}-2 &= 6 \\ \sqrt{3x+1} &= 8 \\ 3x+1 &= 64 \\ 3x &= 63 \\ x &= 21 \end{aligned}$$

$$18. \begin{aligned} \sqrt[3]{x+5}+6 &= 4 \\ \sqrt[3]{x+5} &= -2 \\ x+5 &= -8 \\ x &= -13 \end{aligned}$$

AC CCGPS Geo B/Adv. Alg
Solving Radical Equations WS 2

Name Key

Solve each equation. Be sure to check for extraneous solutions.

$$1. \begin{aligned} x+3 &= x\sqrt{2} \\ x-x\sqrt{2} &= -3 \\ x(1-\sqrt{2}) &= -3 \\ x &= \frac{-3}{1-\sqrt{2}} \cdot \frac{(1+\sqrt{2})}{(1+\sqrt{2})} = \boxed{x=3+3\sqrt{2}} \end{aligned}$$

$$2. \begin{aligned} 4x-\sqrt{2} &= x\sqrt{3}+2\sqrt{2} \\ 4x-x\sqrt{3} &= 3\sqrt{2} \\ x(4-\sqrt{3}) &= 3\sqrt{2} \\ x &= \frac{3\sqrt{2}}{4-\sqrt{3}} \cdot \frac{(4+\sqrt{3})}{(4+\sqrt{3})} = \boxed{x = \frac{12\sqrt{2}+3\sqrt{6}}{13}} \end{aligned}$$

$$3. \begin{aligned} 5-\sqrt{3x+4} &= 0 \\ \sqrt{3x+4} &= 5 \\ 3x+4 &= 25 \\ 3x &= 21 \\ x &= 7 \end{aligned}$$

$$4. \begin{aligned} \sqrt[3]{5x+4}-4 &= 0 \\ \sqrt[3]{5x+4} &= 4 \\ 5x+4 &= 64 \\ 5x &= 60 \\ x &= 12 \end{aligned}$$

$$5. \begin{aligned} \sqrt{3x-2} &= 5 \\ 3x-2 &= 25 \\ 3x &= 27 \\ x &= 9 \end{aligned}$$

$$6. \begin{aligned} \sqrt[3]{4x+9} &= 5 \\ 4x+9 &= 125 \\ 4x &= 116 \\ x &= \frac{116}{4} = 29 \end{aligned}$$

$$7. \begin{aligned} 18-3x &= x\sqrt{2} \\ x\sqrt{2}+3x &= 18 \\ x(\sqrt{2}+3) &= 18 \\ x &= \frac{18}{\sqrt{2}+3} \cdot \frac{(\sqrt{2}-3)}{(\sqrt{2}-3)} = \boxed{x = \frac{18\sqrt{2}-54}{-7}} \end{aligned}$$

$$8. \begin{aligned} \sqrt{x+8}-5 &= 0 \\ x+8 &= 25 \\ x &= 17 \end{aligned}$$

$$9. \begin{aligned} (\sqrt{x-7})^2 &= (4)^2 \\ x-7 &= 64 \\ x &= 71 \end{aligned}$$

$$10. \begin{aligned} \sqrt[3]{3x-2} &= 0 \\ \sqrt[3]{3x} &= 2 \\ 3x &= 8 \\ x &= \frac{8}{3} \end{aligned}$$

$$11. \begin{aligned} \sqrt[4]{8x-5}-1 &= 2 \\ \sqrt[4]{8x-5} &= 3 \\ 8x-5 &= 81 \\ 8x &= 86 \\ x &= \frac{86}{8} \end{aligned}$$

$$12. \begin{aligned} \sqrt{1-4x}-8 &= -6 \\ \sqrt{1-4x} &= 2 \\ 1-4x &= 4 \\ -4x &= 3 \\ x &= -\frac{3}{4} \end{aligned}$$

$$13. \sqrt[3]{7x-2}+12=7$$

~~0~~

$$14. \begin{aligned} \sqrt[3]{6x-5}+2 &= -3 \\ \sqrt[3]{6x-5} &= -5 \\ 6x-5 &= -125 \\ 6x &= -120 \\ x &= -20 \end{aligned}$$

$$15. \begin{aligned} \sqrt{6x-4} &= \sqrt{2x+10} \\ 6x-4 &= 2x+10 \\ 4x &= 14 \\ x &= \frac{7}{2} \end{aligned}$$

$$16. \begin{aligned} \sqrt{9x-4} &= \sqrt{7x-20} \\ 9x-4 &= 7x-20 \\ 2x &= -16 \\ x &= -8 \end{aligned}$$

$\frac{16}{64}$

$\frac{18}{54}$

$$3. \quad -\sqrt{5x+13} \geq -2$$

$$\sqrt{5x+13} \leq 2$$

$$5x+13 \geq 0$$

$$5x \geq -13$$

$$x \geq -13/5$$

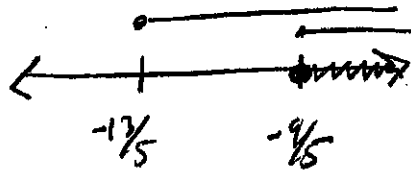
-2.6

$$5x+13 \geq 4$$

$$5x \geq -9$$

$$x \geq -9/5$$

-1.8



$$[-9/5, \infty)$$

Mar 17-11:06 AM

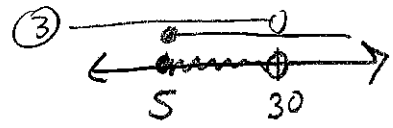
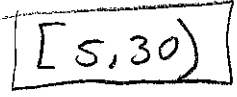
Honors Algebra II
Solving Radical Inequalities

Name: key

1) $\sqrt{x-5} + 7 < 12$
 $\sqrt{x-5} < 5$

① $\sqrt{x-5} < 5$
 $x-5 < 25$
 $x < 30$

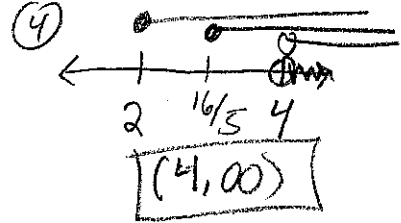
② $x-5 \geq 0$
 $x \geq 5$



3. $\sqrt{5x-16} > \sqrt{2x-4}$

① $5x-16 > 2x-4$
 $3x > 12$
 $x > 4$

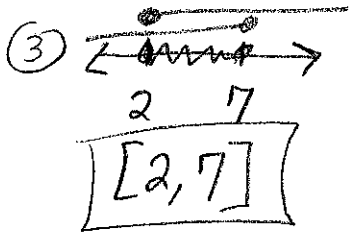
③ $2x-4 \geq 0$
 $x \geq 2$



② $5x-16 \geq 0$
 $x \geq 16/5$

5. $3 + \sqrt{5x-10} \leq 8$
 $\sqrt{5x-10} \leq 5$

① $5x-10 \leq 25$
 $5x \leq 35$
 $x \leq 7$

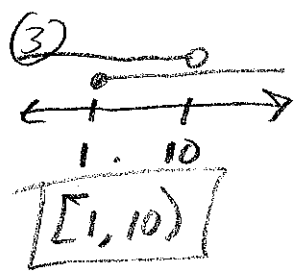


② $5x-10 \geq 0$
 $5x \geq 10$
 $x \geq 2$

7. $4 > \sqrt{4x-4} - 2$
 $6 > \sqrt{4x-4}$

① $36 > 4x-4$
 $40 > 4x$
 $4x < 40$
 $x < 10$

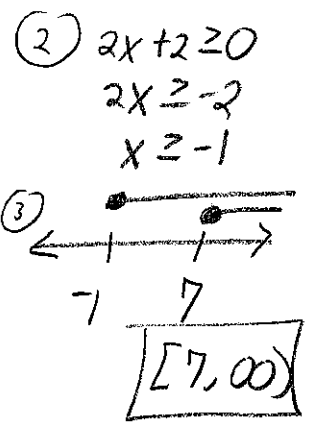
② $4x-4 \geq 0$
 $x \geq 1$



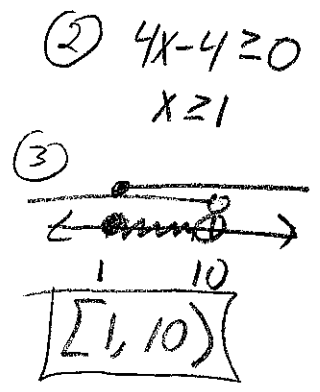
2. $-\sqrt{5x+13} \geq 2$
 $\sqrt{5x+13} \leq -2$

\emptyset
 B/c $\sqrt{\quad} \neq -$

4. $\sqrt{2x+2} + 1 \geq 5$
 $\sqrt{2x+2} \geq 4$
 $2x+2 \geq 16$
 $2x \geq 14$
 $x \geq 7$



6. $4 > \sqrt{4x-4} - 2$
 $6 > \sqrt{4x-4}$
 $36 > 4x-4$
 $40 > 4x$
 $4x < 40$
 $x < 10$



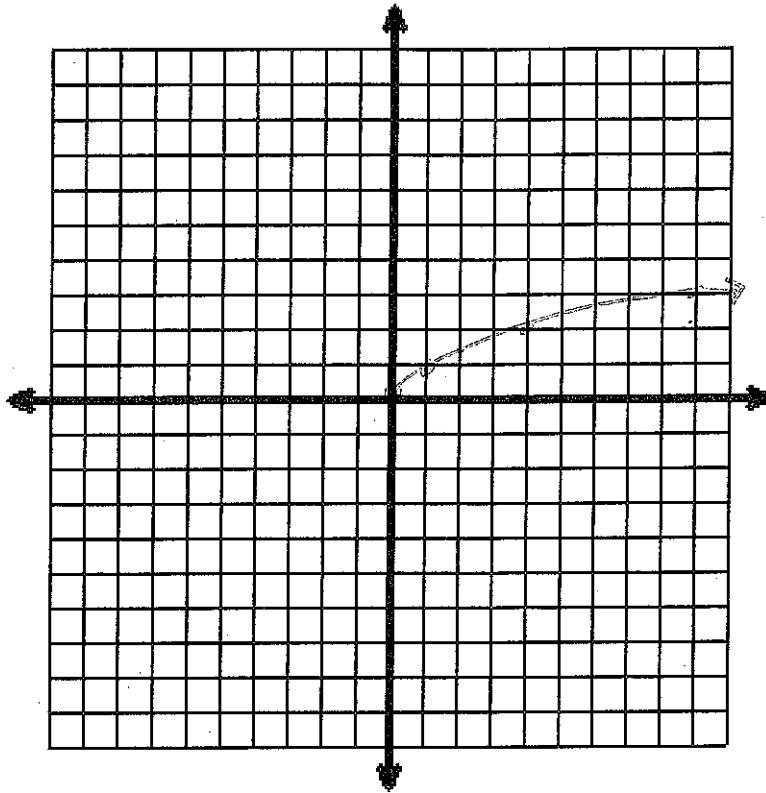
8. $-\sqrt{6x-5} > 3$
 $\sqrt{6x-5} < -3$

\emptyset
 B/c $\sqrt{\quad}$ cannot be $<$

Graphic Organizer: RADICAL FUNCTION

Parent Function: $f(x) = \sqrt{x}$

$f(x) = \sqrt{x}$	
x	f(x)
-2	N/A
-1	N/A
0	0
1	1
2	1.4
4	2
9	3



Describe:

- jets to the right
- 1/2 of a parabola on its side
- as x increases y does y

x - intercepts (zeros)

$(0, 0)$

Domain:
 $x \geq 0 \quad [0, \infty)$

Range:
 $y \geq 0 \quad [0, \infty)$

y - intercept

$(0, 0)$

Intervals of Increase/Decrease

$(0, \infty)$ increase
Decrease none

End Behavior

$x \rightarrow \infty, f(x) \rightarrow \infty$

Max or Min

Min
 $(0, 0)$

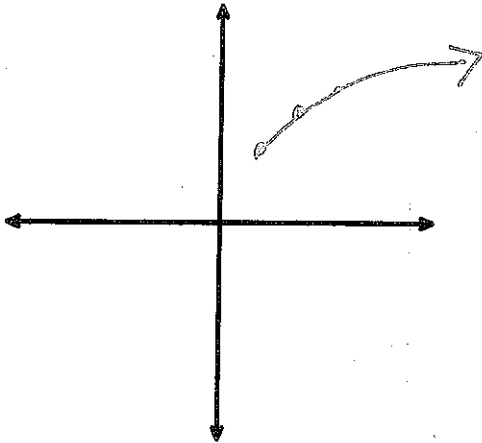
Fill in the missing information:

$$f(x) = \sqrt{x-1} + 2$$

1) Make a table of values ($x = -3, -2, -1, 0, 1, 2, 3$)

X	y	X	y
-3	NA	1	2
-2	NA	2	3
-1	NA	3	3.9
0	NA		

2) Graph the points



3) x-intercept(s) none, y-intercept(s) none

4) Domain: $[1, \infty)$ Range: $[2, \infty)$

5) Interval of increase: $(1, \infty)$ (x-values only)

6) Interval of decrease: none (x-values only)

7) End behavior: (what is happening at the arrows)

$$x \rightarrow \infty \quad f(x) \rightarrow \infty$$

8) Maximum or minimum point: (just one point)

$$\text{min } (1, 2)$$

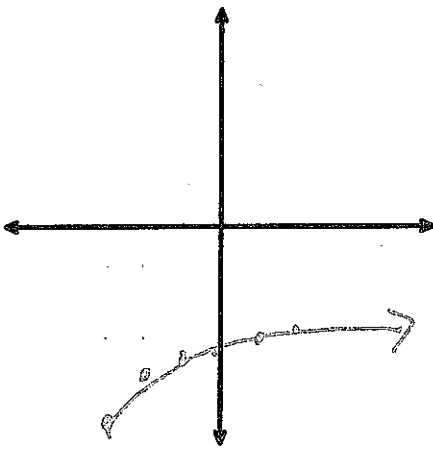
Fill in the missing information:

$$f(x) = \sqrt{x+3} - 5$$

1) Make a table of values ($x = -3, -2, -1, 0, 1, 2, 3$)

x	y	x	y
-3	-5	1	-3
-2	-4	2	-2.8
-1	-3.6	3	-2.6
0	-3.3		

3) Graph the points



3) x-intercept(s) ~~none~~ $(22, 0)$, y-intercept(s) $(0, -3.3)$

4) Domain: $[-3, \infty)$ Range: $[-5, \infty)$

6) Interval of increase: $(-5, \infty)$ (x-values only)

6) Interval of decrease: none (x-values only)

7) End behavior: (what is happening at the arrows)

$$x \rightarrow \infty, f(x) \rightarrow \infty$$

8) Maximum or minimum point: (just one point)

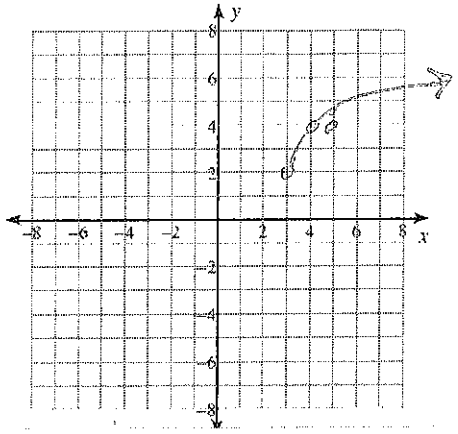
$$\text{min: } (-3, -5)$$

Key

Graphing Radical Functions

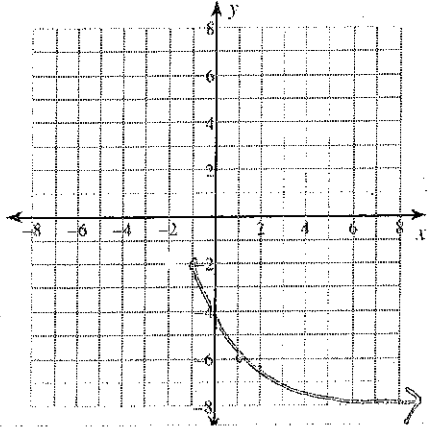
Graph the following radical functions equations. List the Domain and Range in interval notation.

1. $f(x) = 2\sqrt{x-3} + 2$



~~scribbles~~
 D: $[3, \infty)$
 R: $[2, \infty)$

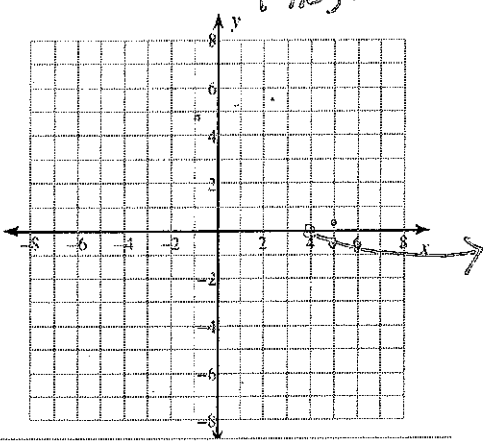
2. $f(x) = -\sqrt{2x+2} - 2$



x	y
-2	error
-1	-2
0	-4.8
1	-6
2	-6.9

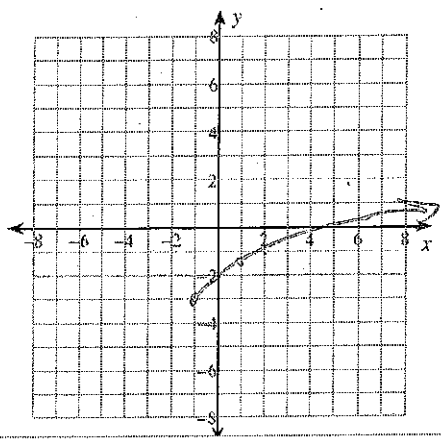
D: $[-1, \infty)$
 R: $[-2, -\infty)$

3. $f(x) = -\frac{1}{3}\sqrt{x-4}$



~~scribbles~~
 D: $[4, \infty)$
 R: $[0, -\infty)$

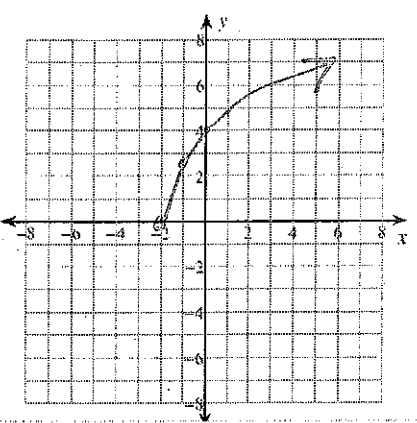
4. $f(x) = \sqrt{x+1} - 3$ $(-1, -3)$



x	y
-1	-3
0	-2
1	-1.6
2	-1.3

D: $[-1, \infty)$
 R: $[-3, \infty)$

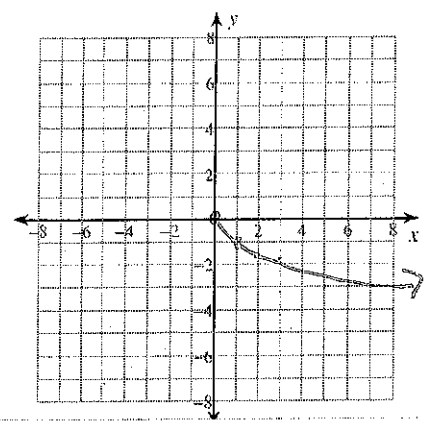
5. $f(x) = 4\sqrt{\frac{1}{2}x+1}$



x	y
-2	0
-1	2.8
0	4
1	4.9
2	5.7

D: $[-2, \infty)$
 R: $[0, \infty)$

6. $f(x) = -\sqrt{x}$



x	y
0	0
1	-1
2	-1.4
3	-1.7

D: $[0, \infty)$
 R: $[0, -\infty)$

Graphing Cube Root Functions

Key

The Cube Root Function

1. What is the parent equation for the Cube Root Function?

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

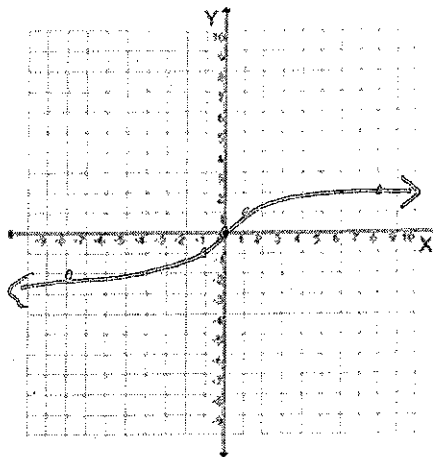
2. Graph the parent function for Cube Root.

3. Domain: $(-\infty, \infty)$

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

4. X-intercept: $(0, 0)$

y-intercept: $(0, 0)$



5. What are the coordinates for the 3 major

points: $(-1, -1)$, $(0, 0)$, $(1, 1)$ $(8, 2)$ $(-8, -2)$

6. Based on your knowledge of parameter changes, describe the roles a, h, and k play for the family of functions $y = a\sqrt[3]{x-h} + k$. (i.e what does a do, what does h do, what does k do, and so on.....)

a: vertical stretch/shrink; negative \rightarrow reflects over x-axis

h: horizontal shift

k: vertical shift

7. How would each of the following graphs change in relation to the parent graph?

a) $y = \sqrt[3]{x-3}$ shift right 3

b) $y = \sqrt[3]{x+4}$ shift left 4

c) $y = -\sqrt[3]{x}$ reflect over x-axis + stretch (vertical)

d) $y = \sqrt[3]{x} + 5$ up 5

e) $y = \sqrt[3]{x} - 6$ down 6

f) $y = 3\sqrt[3]{x-2} + 7$ left 2, up 7, stretch (vertical)

Graphing Cube Root Functions

Key

8. State the Domain and Range of each function.

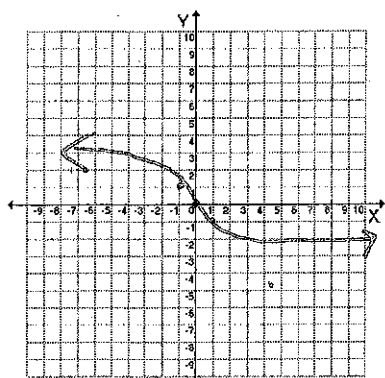
	Domain	Range
a) $y = 5\sqrt[3]{x}$	<u>$(-\infty, \infty)$</u>	<u>$(-\infty, \infty)$</u>
b) $y = \sqrt[3]{x+8}$	↓	↓
c) $y = -\sqrt[3]{x-7}$	↓	↓
d) $y = \sqrt[3]{x+2} - 3$	↓	↓
e) $y = -\sqrt[3]{x-4} + 1$	↓	↓

9. Graph the following cube root functions using parameter changes.

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

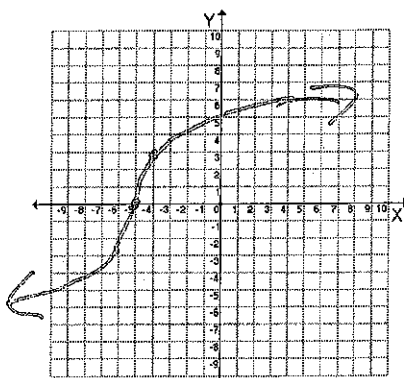
b) $y = 3\sqrt[3]{x+5}$

c) $y = \sqrt[3]{x} - 2$



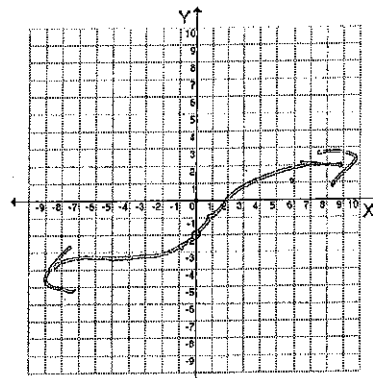
Domain: \mathbb{R}

Range: \mathbb{R}



Domain: \mathbb{R}

Range: \mathbb{R}



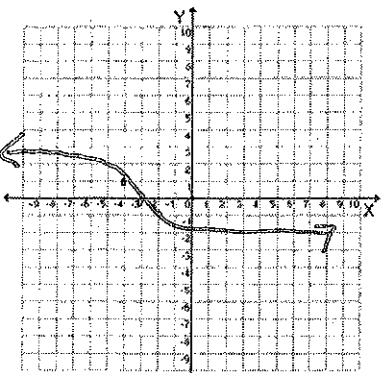
Domain: \mathbb{R}

Range: \mathbb{R}

d) $y = -\sqrt[3]{x+3}$

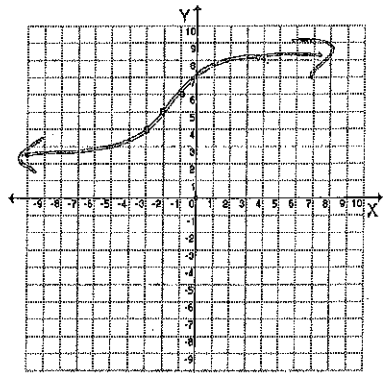
e) $y = \sqrt[3]{x+2} + 5$

f) $y = -\sqrt[3]{x+3} - 3$



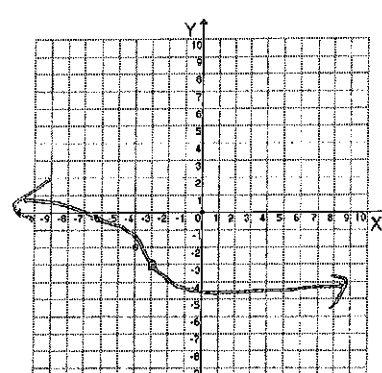
Domain: \mathbb{R}

Range: \mathbb{R}



Domain: \mathbb{R}

Range: \mathbb{R}

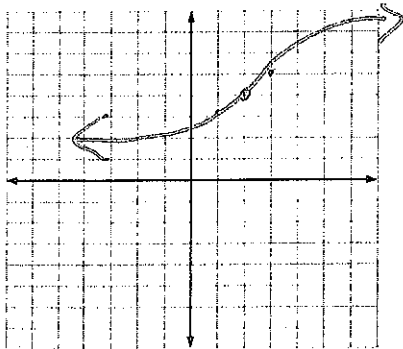


Domain: \mathbb{R}

Range: \mathbb{R}

Graph the following radical functions. List the Domain and Range in interval notation.

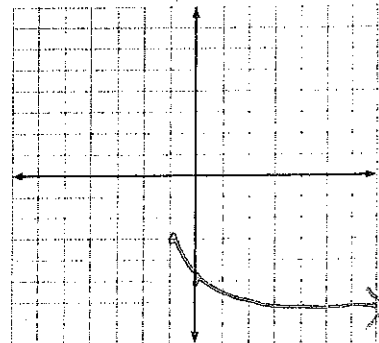
1. $f(x) = \sqrt[3]{x-2} + 4$



x	y
1	3
2	4
3	5

domain: \mathbb{R}
range: \mathbb{R}

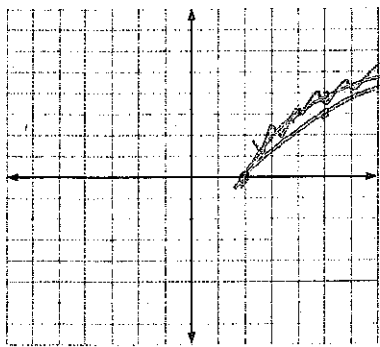
2. $f(x) = -2\sqrt{x+1} - 3$



x	y
-1	-3
0	-5
3	-7

domain: $[-1, \infty)$
range: $(-\infty, -3]$

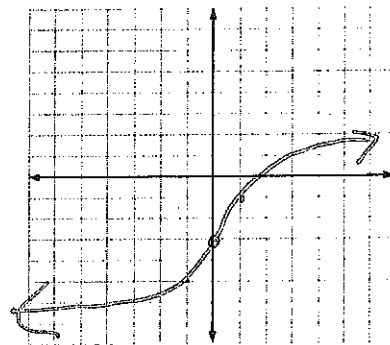
3. $f(x) = \sqrt{3x-6} = \sqrt{3(x-2)}$



x	y
2	0
3	1
5	2

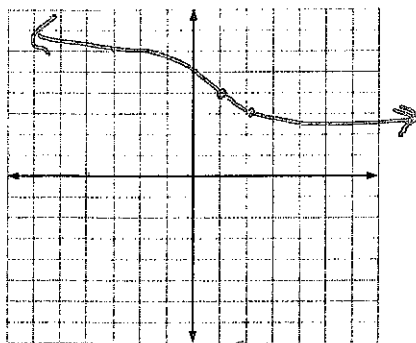
domain: _____
range: _____

4. $f(x) = 2\sqrt{x} - 3$



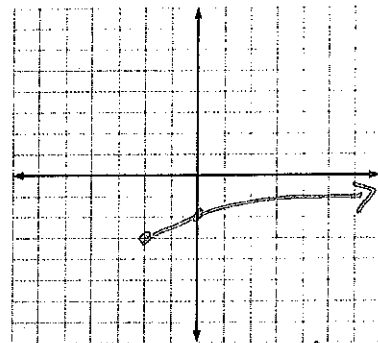
domain: \mathbb{R}
range: \mathbb{R}

5. $f(x) = -\sqrt[3]{x-1} + 4$



domain: \mathbb{R}
range: \mathbb{R}

6. $f(x) = \sqrt{\frac{1}{2}x+1} - 3 = \sqrt{\frac{1}{2}(x+2)} - 3$

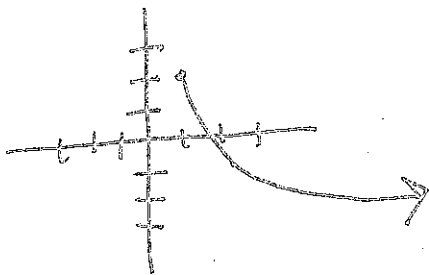


x	y
-2	-3
0	-2.5
2	-2

domain: $[-2, \infty)$
range: $[-3, \infty)$

Review Answers

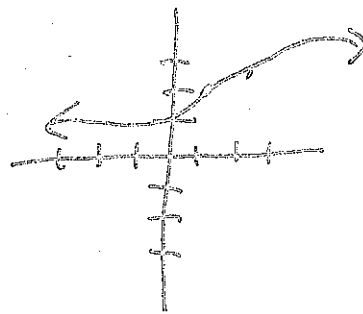
1) $y = -3\sqrt{x-1} + 2$



D: $[1, \infty)$

R: $(-\infty, 2]$

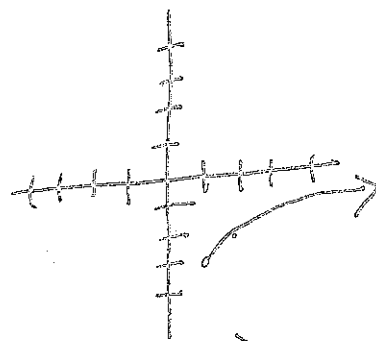
2) $y = \sqrt[3]{x-1} + 2$



D: \mathbb{R}

R: \mathbb{R}

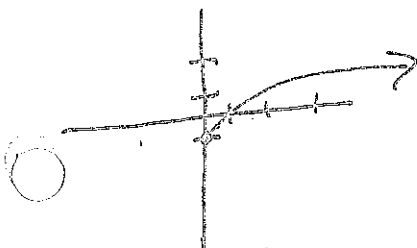
3) $y = \sqrt{2x-1} - 3$



D: $[0.5, \infty)$

R: $[-3, \infty)$

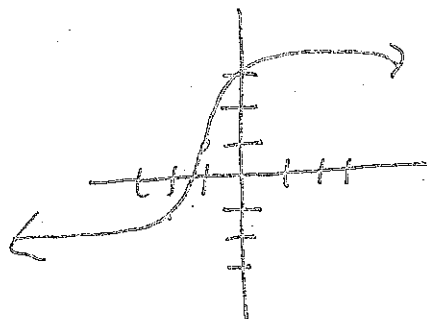
4) $y = \frac{1}{2}\sqrt{x} - 1$



D: $[0, \infty)$

R: $[-1, \infty)$

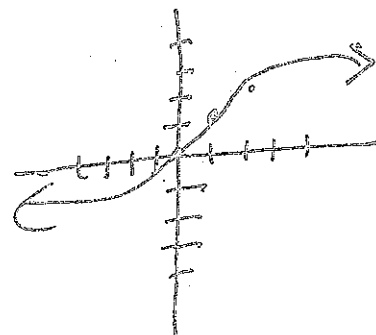
5) $y = 2\sqrt[3]{x+1} + 1$



D: \mathbb{R}

R: \mathbb{R}

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



D: \mathbb{R}

R: \mathbb{R}

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

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

$$x-5 = \frac{400}{9}$$

$$x = \frac{400}{9} + \frac{45}{9}$$

$$\boxed{x = \frac{445}{9}}$$

8) $x(1+\sqrt{2}) = \frac{5}{1+\sqrt{2}}$

$$x = \frac{5}{(1+\sqrt{2})(1-\sqrt{2})}$$

$$x = \frac{5-5\sqrt{2}}{1-2}$$

$$x = \frac{5-5\sqrt{2}}{-1}$$

$$\boxed{x = -5+5\sqrt{2}}$$

9) $\sqrt{x-4} = 5$

$$x-4 = 25$$

$$\boxed{x = 29}$$

$$10) \sqrt{2x-3} = (x-3)^2$$

$$2x-3 = x^2 - 6x + 9$$

$$0 = x^2 - 8x + 12$$

$$0 = (x-6)(x-2)$$

$$x=6, x=2$$

$$\sqrt{2(2)-3} = 2-3 \quad \uparrow$$

$$\sqrt{2(6)-3} = 6-3 \quad \checkmark$$

$$11) \sqrt[3]{x-4} = -3$$

$$x-4 = -27$$

$$x = -23$$

$$12) \sqrt[4]{x + \frac{1}{2}} + 1 = -1$$

$$\sqrt[4]{x + \frac{1}{2}} = -2$$

$$x + \frac{1}{2} = 16$$

$$x = 15\frac{1}{2}$$

$$13) \sqrt{2x-3} > \sqrt{4x-1}$$

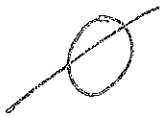
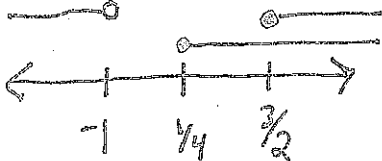
$$2x-3 \geq 0 \quad 4x-1 \geq 0$$

$$x \geq \frac{3}{2} \quad x \geq \frac{1}{4}$$

$$2x-3 > 4x-1$$

$$-2x > 2$$

$$x < -1$$



$$14) \sqrt{3x+1} \leq 3$$

$$3x+1 \leq 9$$

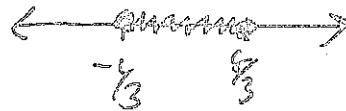
$$3x \leq 8$$

$$x \leq \frac{8}{3}$$

$$3x+1 \geq 0$$

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

$$[-\frac{1}{3}, \frac{8}{3}]$$



$$15) \emptyset$$

$$16) \sqrt{2x-4} > 2$$

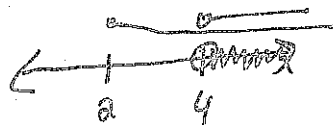
$$2x-4 \geq 0$$

$$x \geq 2$$

$$2x-4 > 4$$

$$2x > 8$$

$$x > 4$$



$$(4, \infty)$$

$$17) \sqrt{2x-3} > 2$$

$$2x-3 \geq 0$$

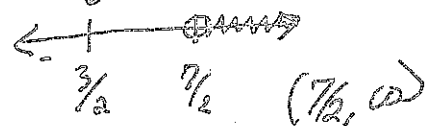
$$2x \geq 3$$

$$x \geq \frac{3}{2}$$

$$2x-3 > 4$$

$$2x > 7$$

$$x > \frac{7}{2}$$



$$18) \sqrt{\frac{x}{3}} > 1$$

$$\frac{x}{3} \geq 0$$

$$x \geq 0$$

$$\frac{x}{3} > 1$$

$$x > 3$$

