UNIT 3: Ch 2 Radical Functions

→ Function involving radical with variable in radicand

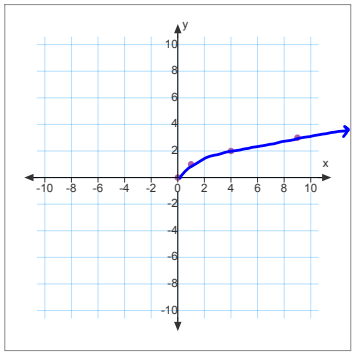
Ex: $f(x) = \sqrt{\text{Radicand}}$

Base graph: $f(x) = \sqrt{x}$

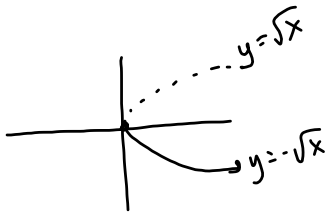
Domain: $\{x \mid x \geq 0, x \in \mathbb{R}\}$

Range: $\{y \mid y \geq 0, y \in \mathbb{R}\}$

x	y
0	0
1	1
4	2
9	3

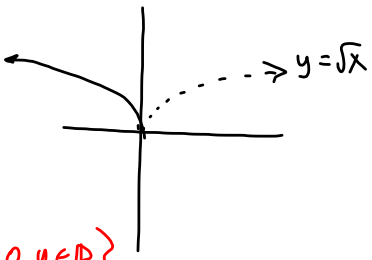


$y = -\sqrt{x}$



$y = \sqrt{-x}$

D: $\{x \mid x \leq 0, x \in \mathbb{R}\}$



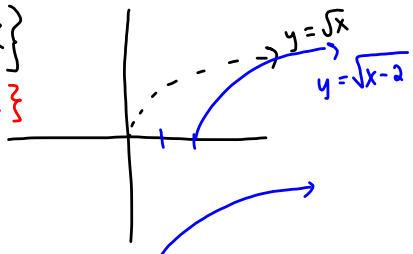
X	Y
-1	1
-4	2

R: $\{y \mid y \geq 0, y \in \mathbb{R}\}$

$y = \sqrt{x-2}$ HT of 2 Right

D: $\{x \mid x \geq 2, x \in \mathbb{R}\}$

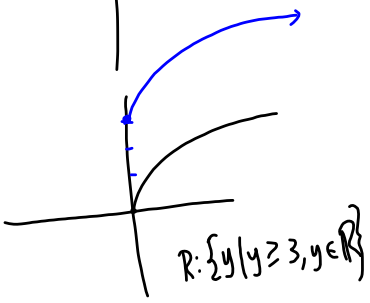
R: $\{y \mid y \geq 0, y \in \mathbb{R}\}$



$y - 3 = \sqrt{x}$

OR $y = \sqrt{x} + 3$

D: $\{x \mid x \geq 0, x \in \mathbb{R}\}$



Ex: $y = 3\sqrt{-(x-1)}$

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

Rule: $(x,y) \rightarrow (-x+1, 3y)$

$y = \sqrt{x}$

x	y
0	0
1	1
4	2
9	3

D: _____

R: _____

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

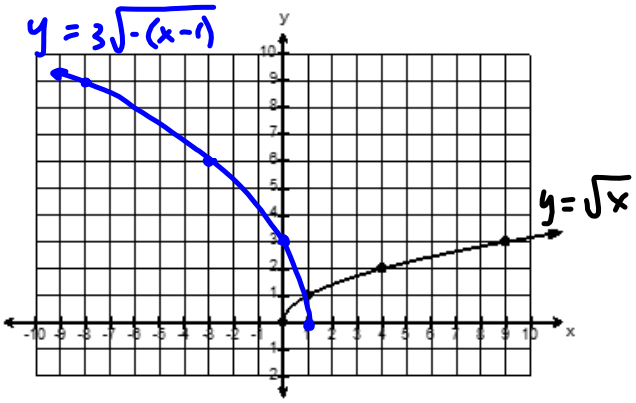
x	y
1	0
0	3
-3	6
-8	9

D: _____

R: _____

D: $\{x \mid x \leq 1, x \in R\}$

R: $\{y \mid y \geq 0, y \in R\}$



Ex: $y-3=-\sqrt{2x}$

Rule: $(x,y)\rightarrow\left(\frac{1}{2}x,-y+3\right)$

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

$y=-f(2x)+3$

D: $\{x\mid x\geq 0, x\in\mathbb{R}\}$

R: $\{y\mid y\leq 3, y\in\mathbb{R}\}$

$y=\sqrt{x}$

x	y
0	0
1	1
4	2
9	3

D: _____

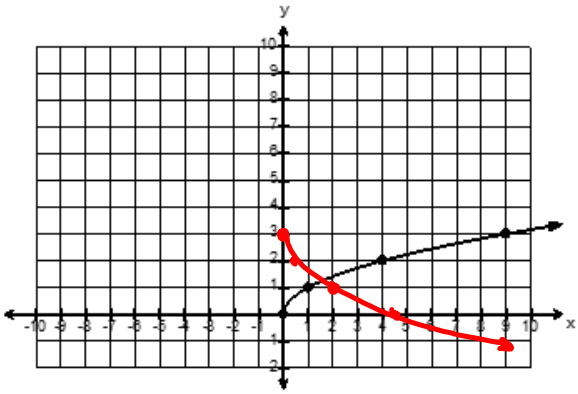
R: _____

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

x	y
0	3
$\frac{1}{2}$	2
2	1
$\frac{9}{2}$	0

D: _____

R: _____



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2, 3, 4, 5, 9, 10, 11

2.2 Square Root of a function

$y = \sqrt{f(x)}$ is the square root of the function $y = f(x)$

Note: $y = \sqrt{f(x)}$ only defined for $f(x) \geq 0$

Ex: Consider $y = 2 - x$ and $y = \sqrt{2 - x}$

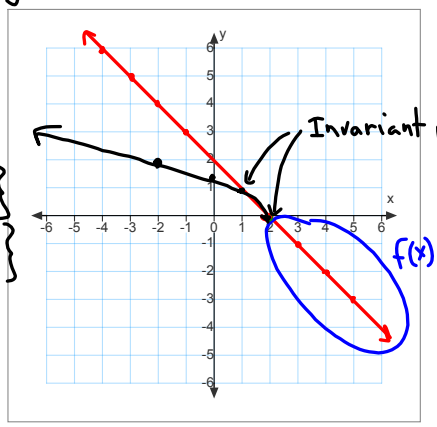
$y = 2 - x$

$y = -x + 2$

x	y	$\sqrt{y}$
0	2	$\sqrt{2}$
1	1	1
2	0	0

D: $\{x \mid x \in \mathbb{R}\}$

R: $\{y \mid y \in \mathbb{R}\}$



for $y = \sqrt{2 - x}$

D: $\{x \mid x \leq 2, x \in \mathbb{R}\}$

R: $\{y \mid y \geq 0, y \in \mathbb{R}\}$

$y = \sqrt{2 - x}$

x	y
0	$\sqrt{2}$
1	$\sqrt{1} = 1$
2	$\sqrt{0} = 0$

Invariant points are (2,0) and (1,1)

(2,0): x-intercept

(1,1): pt of intersection

make functions =

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

$(2 - x)(2 - x) = 2 - x$

$4 - 4x + x^2 = 2 - x$

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

$(x - 2)(x - 1) = 0$

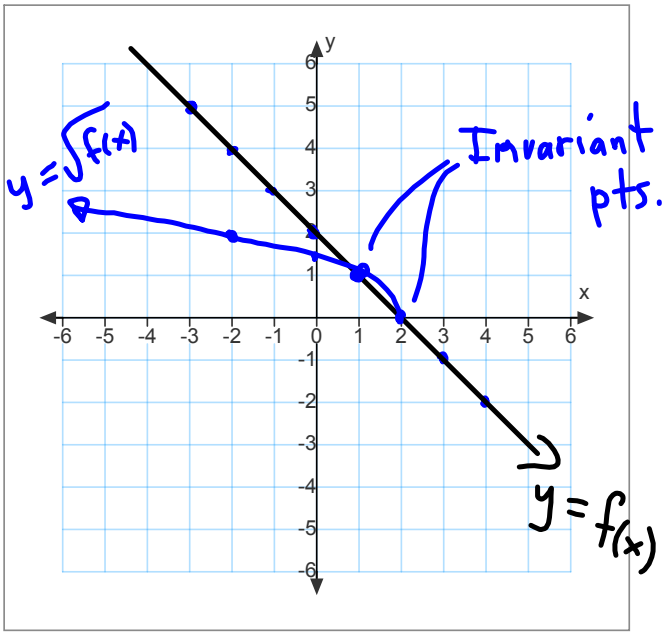
$x = 2 \quad x = 1$

Ex: Analyze $y = 2 - x$ and $y = \sqrt{2 - x}$

$y = 2 - x$

$y = -x + 2$

x	y	$\sqrt{y}$
-2	4	2
-1	3	$\sqrt{3} = 1.7$
0	2	$\sqrt{2} = 1.4$
1	1	1
2	0	0



$y = 2 - x$

$D: \{x \mid x \in \mathbb{R}\}$

$R: \{y \mid y \in \mathbb{R}\}$

$y = \sqrt{2 - x}$

$D: \{x \mid x \leq 2, x \in \mathbb{R}\}$

$R: \{y \mid y \geq 0, y \in \mathbb{R}\}$

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

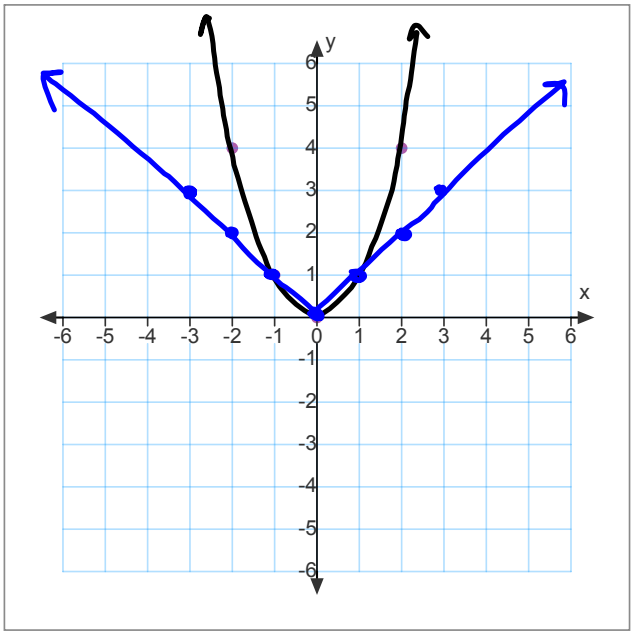
$(2 - x)(2 - x) = 2 - x$

$4 - 4x + x^2 = 2 - x$

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

$(x - 2)(x - 1) = 0$

$x = 2 \quad x = 1$

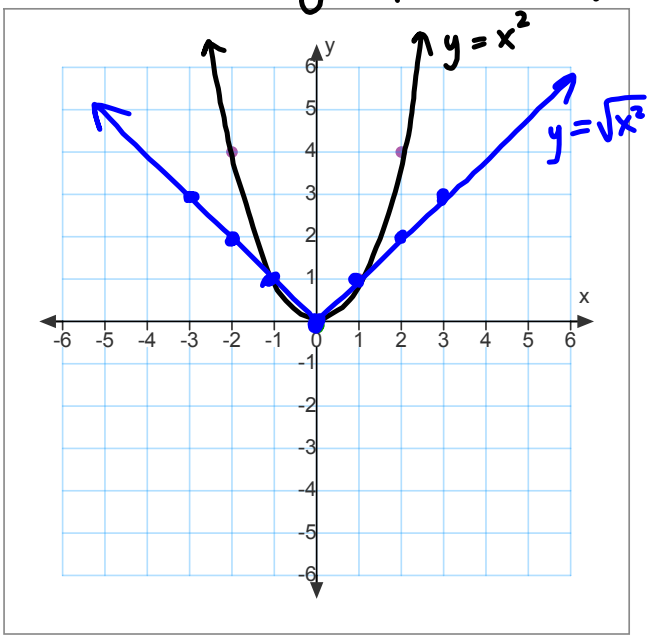


$y = x^2$

$y = \sqrt{x^2} = |x|$

$|x| = \begin{cases} x, \text{ if } x \geq 0 \\ -x, \text{ if } x < 0 \end{cases}$

Sketching the square root function from the graph of the original function



Note:

$y = \sqrt{x^2} = |x|$

$$|x| = \begin{cases} x, \text{ if } x \geq 0 \\ -x, \text{ if } x < 0 \end{cases}$$

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