Pre-Calculus 12 Enriched Radical & Rational Functions

Lesson 3 Properties of Radical Functions

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

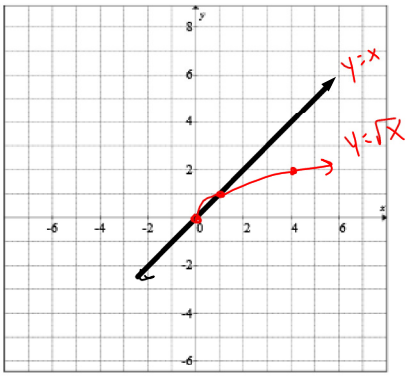
- $y = \sqrt{f(x)}$ is only defined for $f(x) \geq 0$

Characteristics Common to all Graphs of $y = f(x)$ and $y = \sqrt{f(x)}$

Domain of $y = \sqrt{f(x)}$ consists only of all values in the domain of $f(x)$ for which $f(x) \geq 0$.

Range of $y = \sqrt{f(x)}$ consists of the square roots of the values in the range of $y = f(x)$ for which $\sqrt{f(x)}$ is defined.

Sketch the graph of $y = x$ and $y = \sqrt{x}$



x	$x = y$	$y = \sqrt{x}$
-2	-2	—
-1	-1	—
0	0	0
¼	¼	½
1	1	1
4	4	2

invariant pts

The value(s) $y = 0$ and $y = 1$ are invariant points if on the graph of $y = f(x)$.

Value of $y = f(x)$	Relative Location of Graph of $y = \sqrt{f(x)}$
$f(x) < 0$ — negative	The graph of $y = \sqrt{f(x)}$ is undefined.
$f(x) = 0$	The graph of $y = \sqrt{f(x)}$ and $y = f(x)$ intersect on the x-axis.
$0 < f(x) < 1$	The graph of $y = \sqrt{f(x)}$ will be above the graph of $y = f(x)$.
$f(x) = 1$	The graph of $y = \sqrt{f(x)}$ and $y = f(x)$ will intersect.
$f(x) > 1$	The graph of $y = \sqrt{f(x)}$ is below the graph of $y = f(x)$.

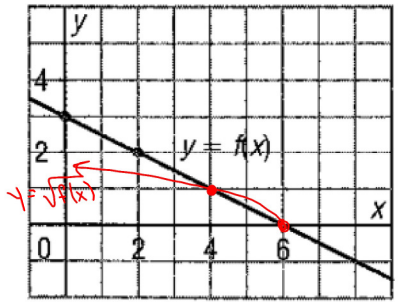
Ex. 1) For each graph of $y = f(x)$ below,

- Sketch the graph of $y = \sqrt{f(x)}$
- State the domain and range of $y = \sqrt{f(x)}$

Take the square root of every *y*-value of *f*(*x*). There are key points to consider.

- The function $y = \sqrt{f(x)}$ doesn't exist where *f*(*x*) is negative
- Invariant points are where *f*(*x*) = 0 and where *f*(*x*) = 1
- Plot another point where $y > 1$ and transform that point

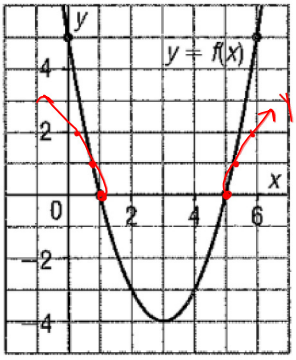
a)



D: $(-\infty, 6]$

R: $[0, \infty)$

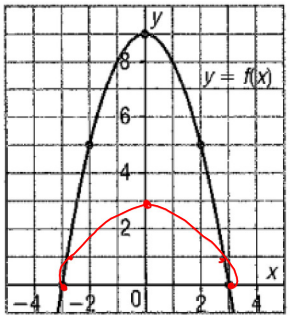
b)



D: $(-\infty, 1] \cup [5, \infty)$

R: $[0, \infty)$

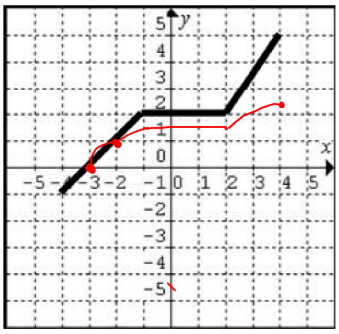
c)



D: $[-3, 3]$

R: $[0, 3]$

d)

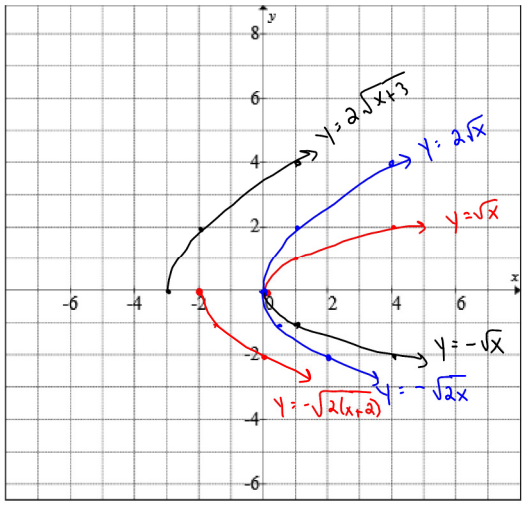


D: $[-3, 4]$

R: $[0, \sqrt{5}]$

Note: Graphs of radical functions can still be sketched using transformations.

Ex. 2) Sketch the graphs of:



a) $y = 2\sqrt{x+3}$ left 3

↑ mult y-coords by 2

b) $y = -\sqrt{2x+4}$

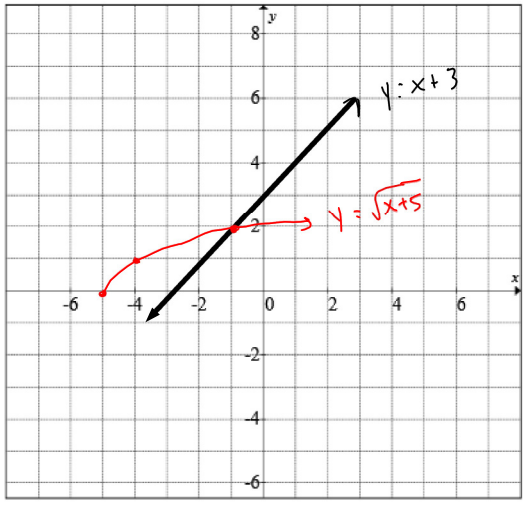
$y = -\sqrt{2(x+2)}$

↑ reflect over x-axis

divide x-coords by 2

Ex. 3) Solve, graphically.

$\sqrt{x+5} = x+3$.



① Sketch $y = x+3$

② Sketch $y = \sqrt{x+5}$

③ State x-value at point of intersection

sol'n

$x = -1$

pg 120 # 5 omit c, h, l

6 b, c, d

pg 126 # 2, 6 e