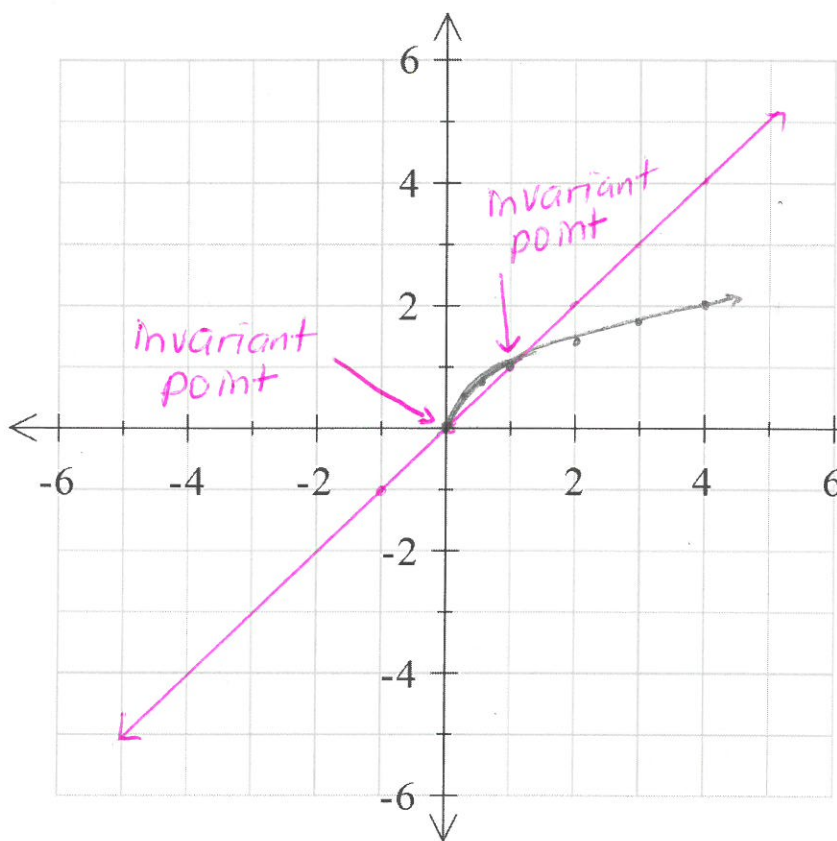## Lesson 1: Sketch the Graph of the Radical Function $y = \sqrt{x}$

Example 1: Sketch the graphs of $y = x$ and $y = \sqrt{x}$ using a table of values on the same grid. State the domains and ranges of both. Identify any invariant points.

x	-1	0	0.25	0.5	1	2	3	4
$y = x$	-1	0	0.25	0.5	1	2	3	4
$y = \sqrt{x}$	Not defined	0	0.5	0.707	1	1.41	1.73	2
	Not real solution	$\sqrt{0}$	$\sqrt{0.25}$	$\sqrt{0.5}$	$\sqrt{1}$	$\sqrt{2}$	$\sqrt{3}$	$\sqrt{4}$

Invariant point

Invariant point

Domain of $y = x$:

$\{x \in \mathbb{R}\}$ $(-\infty, \infty)$
Set notation   interval notation

Range of $y = x$:

$\{y \in \mathbb{R}\}$ $(-\infty, \infty)$
Set notation   interval notation

Domain $y = \sqrt{x}$:

$\{x \geq 0, x \in \mathbb{R}\}$ $[0, \infty)$

Range $y = \sqrt{x}$:

$\{y \geq 0, y \in \mathbb{R}\}$ $[0, \infty)$

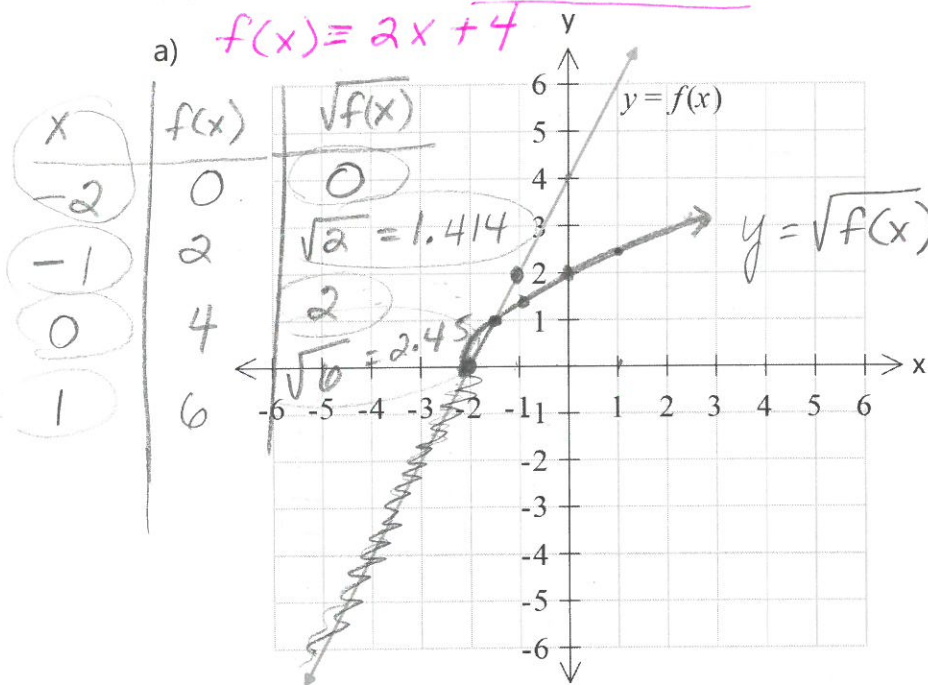The invariant points are $(0, 0)$ and $(1, 1)$

Additional Notes:

Define Radical Function:
A radical function has the form $y = \sqrt{f(x)}$, where $f(x)$ is a function. The square of a number is only defined for non-negative number, so the domain of $y = \sqrt{f(x)}$ is a set of values for which $f(x) \geq 0$.
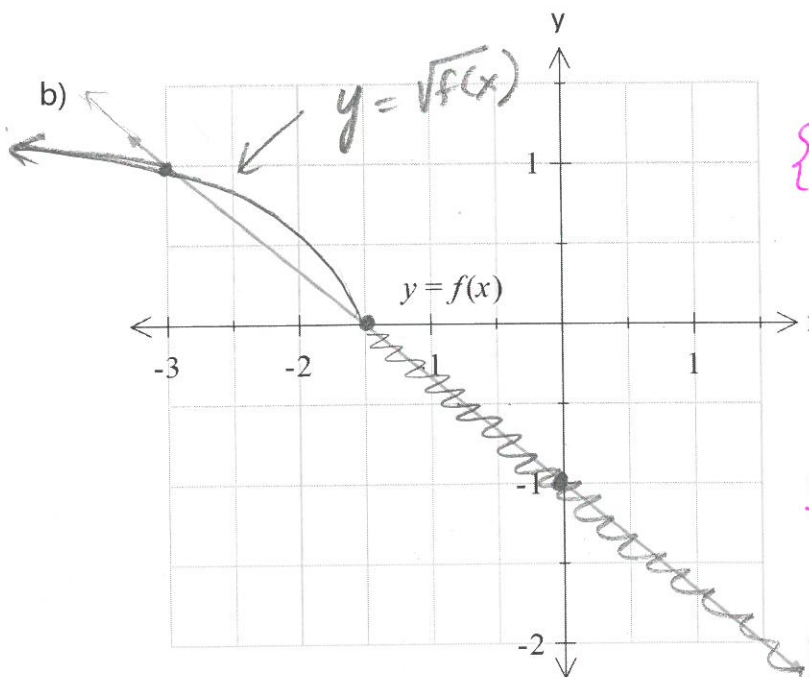
Lesson 2: Square Root of a Function

Example 1: Given the graph of $y = f(x)$, where $f(x)$ is a linear function, sketch the graph of $y = \sqrt{f(x)}$. State the domain and range.

a) $f(x) = 2x + 4$

x	$f(x)$	$\sqrt{f(x)}$
-2	0	0
-1	2	$\sqrt{2} = 1.414$
0	4	2
1	6	$\sqrt{6} = 2.45$

$y = f(x)$

$y = \sqrt{f(x)}$

Domain: of $y\sqrt{f(x)}$

$\{x \geq -2, x \in \mathbb{R}\}$ $[-2, \infty)$

Range: $y = \sqrt{f(x)}$

$\{y \geq 0, y \in \mathbb{R}\}$ $[0, \infty)$

b)

$y = \sqrt{f(x)}$

$y = f(x)$

Domain:

$\{x \leq -1.5, x \in \mathbb{R}\}$ $(-\infty, -1.5]$

Range:

$\{y \geq 0, y \in \mathbb{R}\}$ $[0, \infty)$
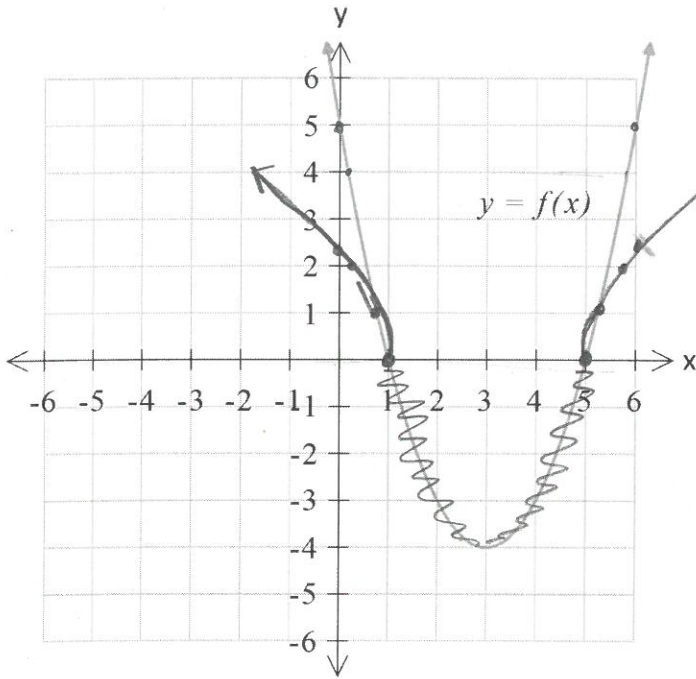
Invariant points

$(-1.5, 0)$ $(-3, 1)$

$\boxed{\sqrt{f(x)} = f(x)}$

where invariant points are.

Example 2: Given the graph of $y = f(x)$, where $f(x)$ is a quadratic function, sketch the graph of $y = \sqrt{f(x)}$. State the domain and range.

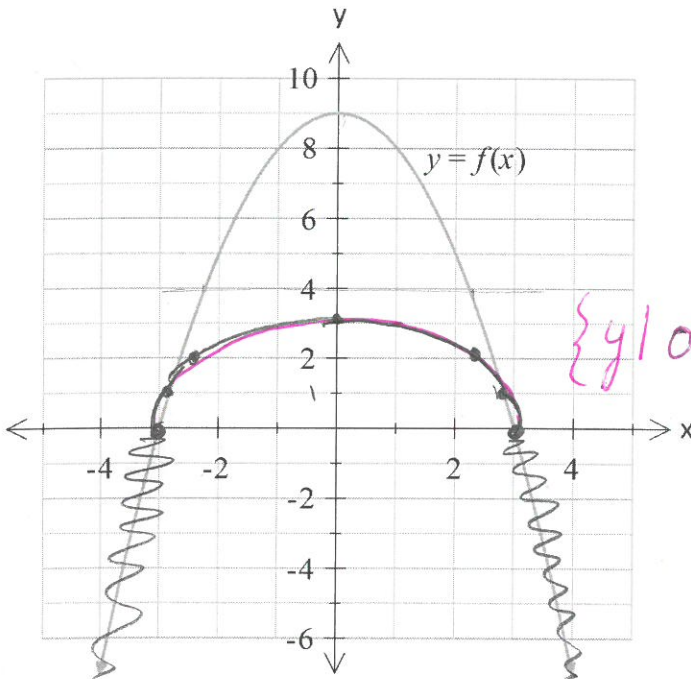$\sqrt{f(x)} = f(x)$
↖ 0 or 1

a)

$y = f(x)$

Domain:

$(-\infty, 1] \cup [5, \infty)$
$\{x \mid x \le 1 \cup x \ge 5\}$

Range:

$\{y \ge 0, y \in \mathbb{R}\}$ $[0, \infty)$

x	$f(x)$	$\sqrt{f(x)}$
-1	0	0
0	5	$\sqrt{5} \doteq 2.236$
5	0	0
6	5	$\sqrt{5} \doteq 2.236$

b)

$y = f(x)$
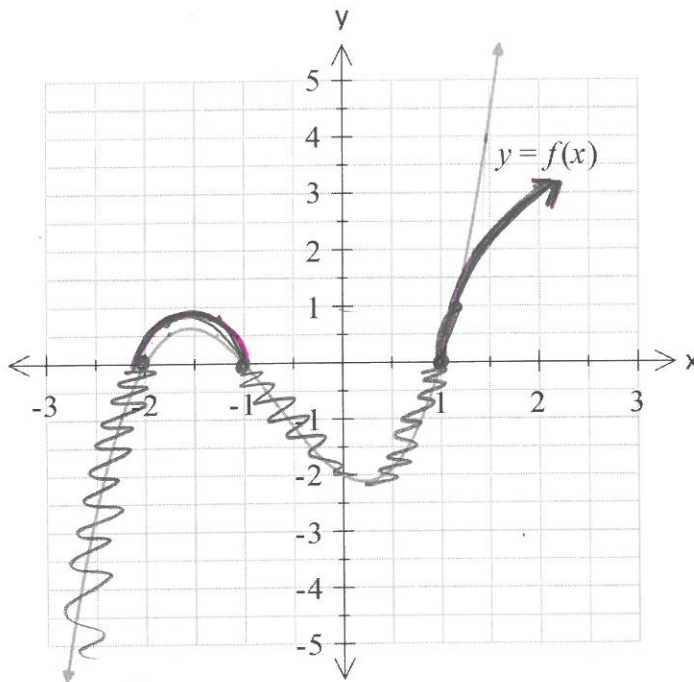
Domain:

$[-3, 3]$ $\{x \mid -3 \le x \le 3\}$

Range:

$\{y \mid 0 \le y \le 3\}$ $[0, 3]$

Example 3: Given the graph of $y = f(x)$, where $f(x)$ is a cubic function, sketch the graph of $y = \sqrt{f(x)}$. State the domain and range.

invariant point
$f(x) = 0$ and $f(x) = 1$

x	$f(x)$	$\sqrt{f(x)}$
-1	0	0
-2	0	0

$D: \{ x \geq 1 \quad \cup \quad -2 \leq x \leq -1 \}$

$R: \{ y \geq 0 \}$

Assignment Time! Work on p.90- 5, 7, 8, 10, 11*, 12, MC 1&2