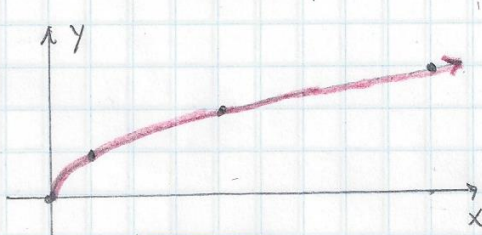
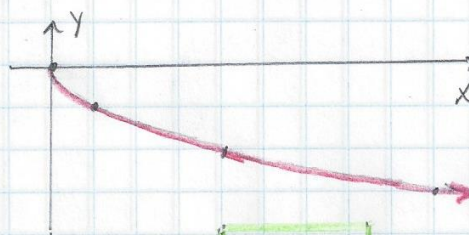


3C.1. Square Root Functions

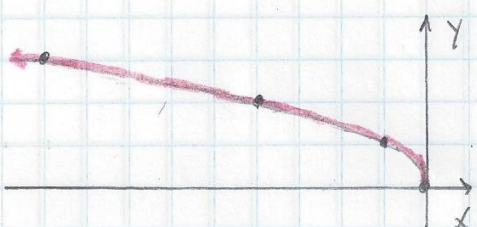
1 of 2



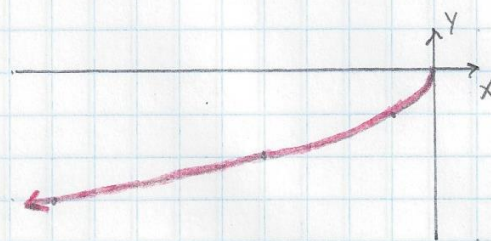
$$y = \sqrt{x}$$



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



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



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

Translations

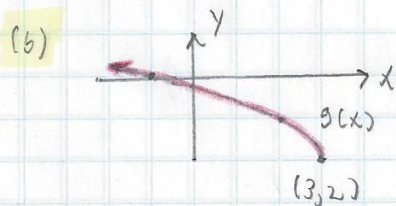
Example #1. For $y = f(x) = \sqrt{-x}$,

- Construct $y = g(x)$ which is a translation of $y = f(x)$ by $(3, -2)$.
- Graph $y = g(x)$.
- State the domain & range of $y = g(x)$.

SOLUTION:

$$(a) (x_0, y_0) = (3, -2), \quad y - y_0 = \sqrt{-(x - x_0)}, \quad y + 2 = \sqrt{-(x - 3)},$$

$$y = g(x) = \sqrt{3 - x} - 2 \leftarrow$$



(c) domain: $-\infty < x \leq 3 \leftarrow$

range: $-2 \leq y < \infty \leftarrow$

3C.1. Square Root Functions

20F2

Horizontal / Vertical Stretch / Compression

Example #2. Let $y = f(x) = \sqrt{x}$ and $y = g(x) = 9\sqrt{x}$.

(a) Express $y = g(x)$ as a vertical stretch of $y = f(x)$.

Explain the stretch in words.

(b) Express $y = g(x)$ as a horizontal compression of $y = f(x)$.

Explain the compression in words.

Solution:

(a) $y = g(x) = 9\sqrt{x} = 9f(x)$ ← which is a vertical stretch, by a factor of 9, of $y = f(x)$ ←

(b) $y = g(x) = 9\sqrt{x} = \sqrt{81} \sqrt{x} = \sqrt{81x} = f(81x)$ ← which is a horizontal compression, by a factor of $\frac{1}{81}$, of $y = f(x)$ ←

Domain and Range

Example #3. State the domain and range of $y = f(x) = \sqrt{8-3x} + 7$.

Solution:

Find the vertex... $8-3x=0$, $3x=8$, $x=\frac{8}{3}=2\frac{2}{3}$

domain: $-\infty < x \leq 2\frac{2}{3}$ ←

range: $7 \leq y < \infty$ ←

$(2, 8.41)$
 $(2\frac{2}{3}, 7)$

x	y
2	8.41
$2\frac{2}{3}$	7 ← vertex
3	undef.