

7.5 Graphing Radical Functions

Old Transformations for Quadratic Functions

TRANSFORMATION RULES FOR VERTEX FORM

$$y = a(x-h)^2 + k$$

Shift Up/Down

- $y = a(x-h) + \underline{k}$ (up)
- $y = a(x-h) - \underline{k}$ (down)

Shift Left/Right

- $y = a(x + \underline{h}) + k$ (left)
- $y = a(x - \underline{h}) + k$ (right)

SHRINKS/STRETCHES

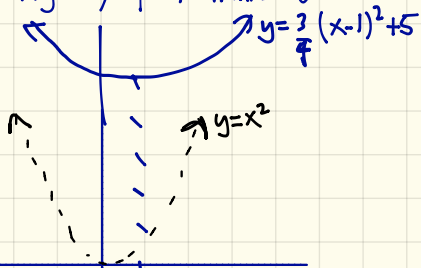
- If $a > 1$, the graph stretches.
- If $0 < a < 1$, the graph shrinks.

Opens Up/Down

- If a is positive, opens upward \uparrow
- If a is negative, opens downward \downarrow (reflection across x-axis)

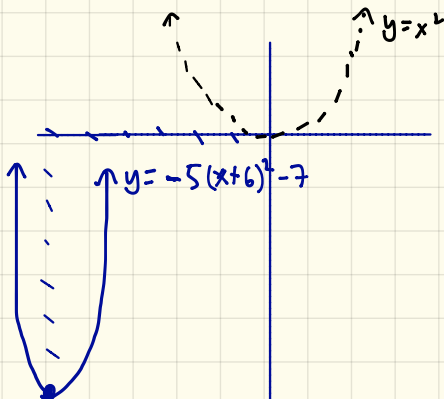
① $f(x) = \frac{3}{4}(x-1)^2 + 5$

shift right 1, up 5, shrinks \uparrow



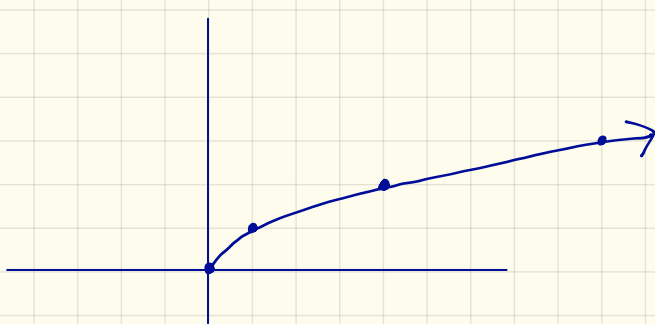
② $f(x) = -5(x+6)^2 - 7$

shift left 6, down 7, stretch \downarrow



new Graphing Radical Functions

Let's consider the function: $y = \sqrt{x}$. Graph the function and analyze the characteristics.



x	$y = \sqrt{x}$
0	0
1	1
4	2
9	3
16	4
25	5

What do you notice?

- Domain: $[0, \infty)$
- Range: $[0, \infty)$

Why is this true?

Square roots cannot be negative! If they are, then they are imaginary.

TRANSFORMATION RULES FOR VERTEX FORM

$$y = a\sqrt{b(x-h)} + k$$

Shift Up/Down

$$y = a\sqrt{b(x-h)} + k \text{ (up)}$$

$$y = a\sqrt{b(x-h)} - k \text{ (down)}$$

Shift Left/Right

$$y = a\sqrt{b(x+k)} + k \text{ (left)}$$

$$y = a\sqrt{b(x-k)} + k \text{ (right)}$$

SHRINKS/STRETCHES

Reflections

- If $a > 1$, the graph vertical stretch
- If $0 < a < 1$, the graph vertical shrink.
- If $b > 1$, the graph horizontal shrink.
- If $0 < b < 1$, the graph horizontal stretch.

- If a is negative, reflect across x-axis
- If b is negative, reflect across y-axis

[Examples] Write the transformations.

① $\sqrt{-x}$

reflection across y-axis

② $f(x) = \sqrt{3x}$

horizontal shrink

③ $f(x) = \sqrt{x-3}$

right 3

④ $f(x) = \sqrt{x} - 5$

down 5

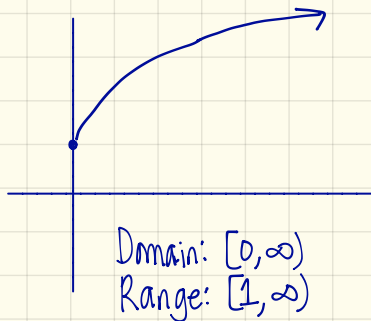
⑤ $f(x) = \sqrt{x+2} + 4$

left 2, up 4

[Examples] Sketch the graph. Give Domain & Range.

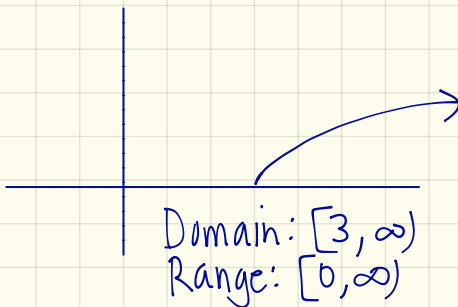
① $f(x) = 4\sqrt{x} + 1$

up 1, vertical stretch by 4



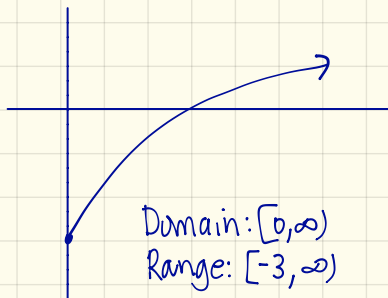
② $f(x) = \sqrt{x-3}$

right 3



③ $f(x) = \sqrt{x} - 3$

down 3



④ $f(x) = \sqrt{-x}$

