

Domain

-restriction

even $\sqrt{\quad}$ $\rightarrow \sqrt{\quad}, \sqrt[4]{\quad}, \dots$

cannot have a negative under an even radical

Ex: $y = \sqrt{x}$ ≥ 0 D: set what's under $\sqrt{\quad} \rightarrow \geq 0$

R: Plug in least/greatest input to find range.

D: $x \geq 0$
R: $y = \sqrt{0} = 0$
 $y \geq 0$

Ex: $y = \sqrt{x-4}$ ≥ 0
D: $x-4 \geq 0$
 $\quad +4 \quad +4$
 $\hline x \geq 4$
R: $y = \sqrt{4-4} = \sqrt{0} = 0$
 $y \geq 0$

Ex: $y = \sqrt{x+3} - 2$
 $(-3, -2)$ D: $x \geq -3$
R: $y \geq -2$
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$y = \sqrt{x+3} - 2$
D: $x+3 \geq 0$
 $\quad -3 \quad -3$
 $\hline x \geq -3$
R: $y = \sqrt{-3+3} - 2$
 $y = -2$
 $y \geq -2$
 $y \geq -2$

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

$$y = \sqrt{-2x+3} - 6$$

$$D: \begin{array}{r} -2x+3 \geq 0 \\ -3 \quad -3 \end{array}$$

$$\begin{array}{r} \leftarrow \\ -2x \geq -3 \\ \frac{-2x}{-2} \geq \frac{-3}{-2} \\ x \leq \frac{3}{2} \end{array}$$

$$R: \begin{array}{r} y = \sqrt{-2(\frac{3}{2})+3} - 6 \\ \quad \downarrow \\ \quad 0 - 6 \end{array}$$

$$\begin{array}{r} y = -6 \\ \boxed{y \geq -6} \end{array}$$

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

$$\sqrt{-2x+3} - 6$$

$$\sqrt{-2(x-\frac{3}{2})} - 6$$

$$\sqrt{-2} \sqrt{x-\frac{3}{2}} - 6$$

$$\begin{array}{r} -\sqrt{2} \cdot \frac{3}{2} + 3 \\ \quad \quad \quad \downarrow \\ \quad \quad \quad -3 + 3 \\ \quad \quad \quad 0 \end{array}$$

- restriction

division by 0

D: - set denominator equal to 0

- These values are not in the domain

R: - think about x growing large

$$\frac{1}{x+3} \quad \frac{x+3=0}{-3-3} \\ x=-3$$

Ex: D: $x \neq -3$

$$y = \frac{1}{\cancel{x}} \neq 0$$

D: $x=0$ not in the domain

$$x \neq 0$$

$$(-\infty, 0) \cup (0, \infty)$$

$$\{x \mid x \neq 0\}$$

Range

* $y = x^{\text{even}}$ D: ARN

$y = x^2$ D: ARN

R: $y \geq k$ if a is \oplus

$y \leq k$ if a is \ominus

① Find vertex - \uparrow

$$y = \overset{\oplus}{\underset{\uparrow}{-3}}(x+6)^2 - 5$$

D: ARN

R: $y \geq -5$

$(h, k) \rightarrow (-6, \overset{\text{min}}{\underline{-5}})$