

Domain and Range

Domain Restrictions on Equations - Finding Domain Algebraically

A. Even Roots: $\sqrt{\quad}$ $\sqrt[4]{\quad}$ $\sqrt[6]{\quad}$ $\sqrt[2n]{\quad}$ Can't take the even root of a negative!

Set inside ≥ 0

Ex: $\sqrt{3x-4} = f(x)$

$$3x-4 \geq 0$$

$$3x \geq 4$$

$$x \geq \frac{4}{3} \quad \text{or} \quad \left[\frac{4}{3}, \infty \right)$$

B. Rational Functions (Fractions):

Denominator $\neq 0$. To find domain restrictions, set denom = 0

Ex: $f(x) = \frac{x}{x^2-4}$ $x^2-4=0$ $x^2=4$ $x=2, -2$ $D: \mathbb{R} \ x \neq 2, -2$

C. Log/Natural Log:

Inside must be ^{greater} > 0

Ex: $f(x) = \log(x+6)$

$$x+6 > 0$$

$$x > -6 \quad \text{or} \quad (-6, \infty)$$

Practice: Give the domain for each of the following equations:

1. $f(x) = \sqrt{x}$

$$x \geq 0$$

$$[0, \infty)$$

2. $f(x) = \frac{1}{x}$

$$x \neq 0$$

3. $f(x) = \ln x$

$$x > 0$$

$$(0, \infty)$$

4. $f(x) = \sqrt[3]{x}$

$$x \geq 0$$

$$[0, \infty)$$

5. $f(x) = \frac{4}{x+6}$

$$x+6 \neq 0$$

$$x \neq -6$$

6. $f(x) = \sqrt[4]{x-7}$

$$x-7 \geq 0$$

$$x \geq 7$$

$$[7, \infty)$$

7. $f(x) = \frac{3x}{2x-5}$

$$2x-5 \neq 0$$

$$2x \neq 5$$

$$\mathbb{R} \ x \neq \frac{5}{2}$$

8. $f(x) = 3x+1$

$$\mathbb{R}$$

$$(-\infty, \infty)$$

9. $f(x) = \frac{3x}{(x+4)(x-1)}$

$$(x+4)(x-1) \neq 0$$

$$x+4 \neq 0$$

$$x \neq -4$$

$$x-1 \neq 0$$

$$x \neq 1$$

10. $f(x) = \sqrt{2x+6}$

$$2x+6 \geq 0$$

$$2x \geq -6$$

$$x \geq -3$$

$$[-3, \infty)$$

11. $f(x) = x^2$

$$\mathbb{R}$$

12. $f(x) = \log(x-5)$

$$x-5 > 0$$

$$x > 5$$

$$(5, \infty)$$