

In Exercises 9–16, find the domain of the function algebraically and support your answer graphically.

9. $f(x) = x^2 + 4$

10. $h(x) = \frac{5}{x-3}$

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

12. $f(x) = \frac{1}{x} + \frac{5}{x-3}$

13. $g(x) = \frac{x}{x^2-5x}$

14. $h(x) = \frac{\sqrt{4-x^2}}{x-3}$

15. $h(x) = \frac{\sqrt{4-x}}{(x+1)(x^2+1)}$

16. $f(x) = \sqrt{x^4-16x^2}$

9) $f(x) = x^2 + 4$ all real numbers $(-\infty, \infty)$

10) $h(x) = \frac{5}{\boxed{x-3}}$ Rational Rest. $x-3 \neq 0$
 $\begin{matrix} +3 & +3 \\ x & \neq 3 \end{matrix}$



Domain $(-\infty, 3) \cup (3, \infty)$

11) $f(x) = \frac{3x-1}{\boxed{(x+3)(x-1)}}$ $(x+3)(x-1) \neq 0$ ZPT
 $\begin{matrix} x+3 \neq 0 & x-1 \neq 0 \\ x \neq -3 & x \neq 1 \end{matrix}$



Domain $(-\infty, -3) \cup (-3, 1) \cup (1, \infty)$

12) $\frac{1}{x} + \frac{5}{x-3}$ Rest. $\boxed{x \neq 0}$
 $\begin{matrix} x-3 \neq 0 \\ \boxed{x \neq 3} \end{matrix}$



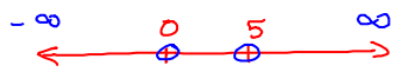
Domain $(-\infty, 0) \cup (0, 3) \cup (3, \infty)$

13) $g(x) = \frac{x}{\boxed{x^2-5x}}$ $x^2-5x \neq 0$
 $x(x-5) \neq 0$
 $\begin{matrix} \boxed{x \neq 0} & x-5 \neq 0 \\ & \boxed{x \neq 5} \end{matrix}$



Domain $(-\infty, 0) \cup (0, 5) \cup (5, \infty)$

$$13) \quad g(x) = \frac{x}{x^2 - 5x}$$



$$\text{Domain } (-\infty, 0) \cup (0, 5) \cup (5, \infty)$$

$$x^2 - 5x \neq 0$$

$$x(x-5) \neq 0$$

$$\boxed{x \neq 0}$$

$$x-5 \neq 0$$

$$\boxed{x \neq 5}$$

$$14) \quad h(x) = \frac{\sqrt{4-x^2}}{x-3}$$

• Restr. $x-3 \neq 0$
 $\boxed{x \neq 3}$

• Restr. $4-x^2$ cannot be negative

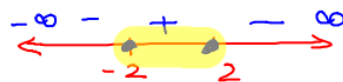
$$4-x^2 \geq 0$$

$$2^2 - x^2 \geq 0$$

Special identity
 $a^2 - b^2 = (a-b)(a+b)$

$$(2-x)(2+x) \geq 0$$

Domain
 $[-2, 2]$



testing: $-3 : (2-(-3))(2+(-3)) = 5 \cdot -1$

$1 : (2-1)(2+1) = 1(3)$

$3 : (2-3)(2+3) = -1(5)$

$$15) \quad h(x) = \frac{\sqrt{4-x}}{(x+1)(x^2+1)}$$

$$(x+1)(x^2+1) \neq 0$$

$$x+1 \neq 0$$

$$\boxed{x \neq -1}$$

$$x^2+1 \neq 0$$

$$\boxed{x^2 \neq -1}$$

$$4-x \geq 0$$

$$+x \quad +x$$

$$4 \geq x$$

$$\boxed{x \leq 4}$$



Domain $(-\infty, -1) \cup (-1, 4]$

16) $f(x) = \sqrt{x^4 - 16x^2}$

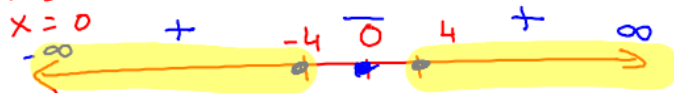
$$x^4 - 16x^2 \geq 0$$

$$x^2 (x^2 - 16) \geq 0 \quad \text{special case } a^2 - b^2$$

$$x^2 (x+4)(x-4) \geq 0$$

$$x^2 = 0$$

$$x = 0$$



$$x+4 = 0$$

$$x = -4$$

$$x-4 = 0$$

$$x = 4$$

test: $-5 : (-5)^2(-5+4)(-5-4)$
 $-1 :$

Domain:

$$(-\infty, -4] \cup [4, \infty)$$