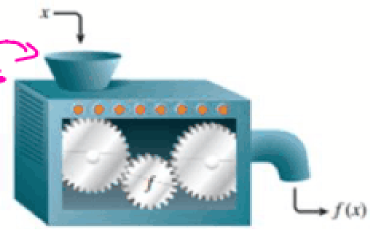
Section 1.2
The Domain of some Basic Functions

radius
r



volume

The machine analogy

Polynomials

A • $3x^2 + 4x$ Quadratic D: $(-\infty, \infty)$
B • $2x^3 + 3x^2 + 2x - 7$ Cubic D: $(-\infty, \infty)$
C • $Volume\ of\ a\ sphere:\ v(r) = \frac{4}{3}\Pi r^3$ **Domain?**

D: $(0, \infty)$ cubic $\cancel{(-\infty, \infty)}$
All positive real numbers.

The domain should fit the situation

Always Think about restrictions

Find the domain of each of the following functions

A • $f(x) = |x + 2|$ Absolute value.

$(-\infty, \infty)$

B • $f(x) = \sqrt{x}$ Radical

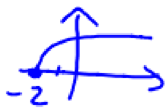
input has to be $+$

• $x \geq 0$

• $[0, \infty)$

• All positive real # and 0

C • $f(x) = \sqrt{x+2}$ Radical



$[-2, \infty)$

$x + 2 \geq 0$

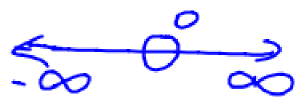
$-2 \quad -2$

$x \geq -2$

• $f(x) = \frac{2}{x}$ Rational

denominator cannot be 0

$x \neq 0$



D: $(-\infty, 0) \cup (0, \infty)$.

• $f(x) = \frac{2}{x+3}$

Rational

$x + 3 \neq 0$

$x \neq -3$

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

Ex $f(x)=\dfrac{(x+2)(x-3)}{(x+2)(x-5)}$

- Type of function Rational → $D \neq 0$
- Restrictions? $D \neq 0$ $(x+2)(x-5) \neq 0$
  - $x+2 \neq 0$, $x \neq -2$
  - $x-5 \neq 0$, $x \neq 5$
- Graph it, what do you notice?

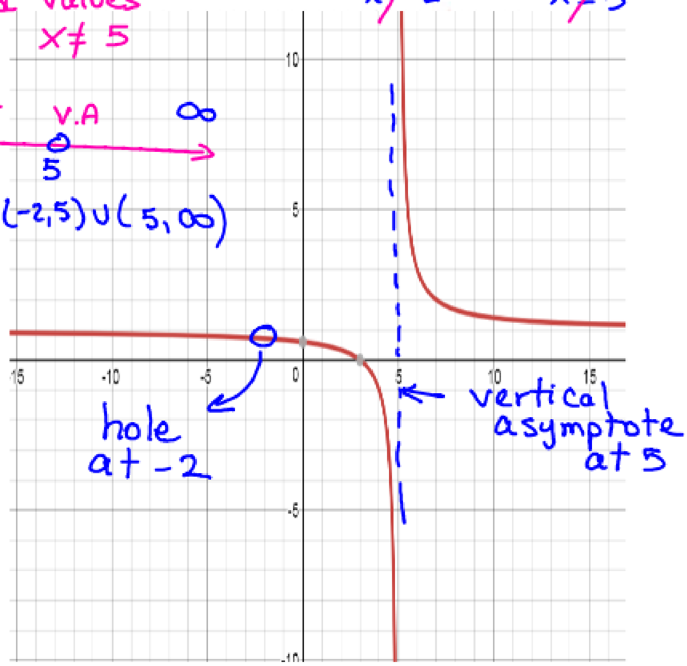
excluded values

$x \neq -2$ $x \neq 5$

$-\infty$ hole V.A ∞

-2 5

D: $(-\infty,-2) \cup (-2,5) \cup (5,\infty)$



Ex

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

Rational hole V.A

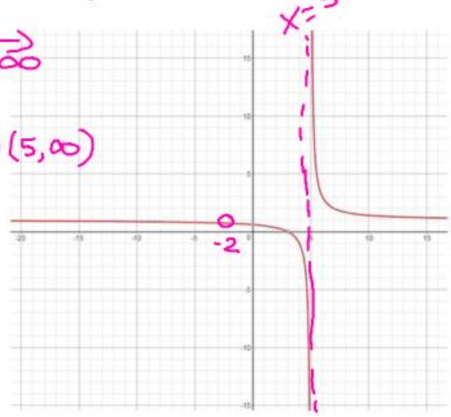
- Type of function Rational
- Restrictions?
- Graph it, what do you notice?

hole V.A

$-\infty$ -2 5 ∞

D:

$(-\infty,-2) \cup (-2,5) \cup (5,\infty)$



$(x+2)(x-5) \neq 0$

$x=-2$ $x=5$

- $x=5$: V.A

$$\frac{\overset{(7)}{(5+2)}\overset{(2)}{(5-3)}}{(5+2)(5-5)} = \frac{14}{0}$$

- $x=-2$:

$$\frac{0}{0} = \frac{(-2+2)(-2-3)}{(-2+2)(-2-5)}$$

hole at -2

Examples: Name the vertical asymptotes and holes in the graphs of the following equations:

1. $f(x) = \dfrac{(x-2)(x+4)}{(x-3)(x+3)(x+4)}$ hole at -4

V.A $x=3$, $x=-3$

2. $f(x) = \dfrac{x^2(x+2)}{x^3(x-2)^2}$

3. $f(x) = \dfrac{(x-1)^2}{(x+1)(2x-3)(\frac{1}{2}x+6)}$

1. Asymptotes: $x = 3, -3$. Holes: $x = -4$.

2. Asymptotes: $x = 2$. Holes: $x = 0$.

3. Asymptotes: $x = -1, \frac{3}{2}, -12$. Holes: NONE.