

1.2 Domain and the range of a function.

What is a function?

$f(x) = \sin x$; $f(x) = x - 3$
 $f\left(\frac{\pi}{6}\right) = \sin \frac{\pi}{6} = \frac{1}{2}$; $f(6) = 3$

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Eg: $f(x) = 5 - x + x^2$

Domain? $f(1) = 5$; $f(\pi) = 5 - \pi + \pi^2$
 $f(0) = 5$; $f(x^2) = \dots$

Domain of f : collection of all real numbers.
 (not)
 $(-\infty, \infty)$ $\mathbb{R}$

General Strategy for finding the domain of a function.

- ① Identify the input values
- ② Identify the restriction on the input. If there is a denominator, set the denominator equal to zero to solve for x . If there is an even root, set the thing under the root ≥ 0 .
- ③ Domain: all real #'s except for those we found in part 2.

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$f(x) = \frac{1+4x}{2-x}$

Domain? Real #'s except for $x=2$.

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

$\{x \mid x \neq 2\}$

$f(x) = \frac{x^2-4}{x^2-5x+6}$ Find the domain.

$x^2-5x+6 = 0$
 $(x-3)(x-2) = 0$ Either $x=3$ or $x=2$

Domain: $(-\infty, 2) \cup (2, 3) \cup (3, \infty)$, $\{x \mid x \neq 2, x \neq 3\}$

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$f(x) = \frac{x^2-4}{x^2-5x+6} = \frac{(x-2)(x+2)}{(x-2)(x-3)} = \frac{x+2}{x-3}$

$\frac{x(x+10)}{x(x-11)}$

$x \neq 2$

Eg: $f(x) = \sqrt{2-x}$

Domain? $\sqrt{2-(-2)} = \sqrt{4} = 2$

$x = -2$

Restriction: $2-x \geq 0$
 $2 \geq x$
 $x \leq 2$

Domain: $(-\infty, 2]$

Even Root: Anything under the root must be ≥ 0

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Eg: $f(x) = \frac{\sqrt{x-6}}{\sqrt{x-4}}$ Find the domain.

$x-6 \geq 0 \rightarrow x \geq 6$ good!
 $x-4 \geq 0 \rightarrow x \geq 4$ good!

Domain: $[6, \infty)$

$\sqrt{x-4} = 0$ (Don't want this)
 $x=4$ bad

$f(x) = \frac{x-2}{x-2}$ Domain: $(-\infty, 2) \cup (2, \infty)$

$\frac{0}{0}$

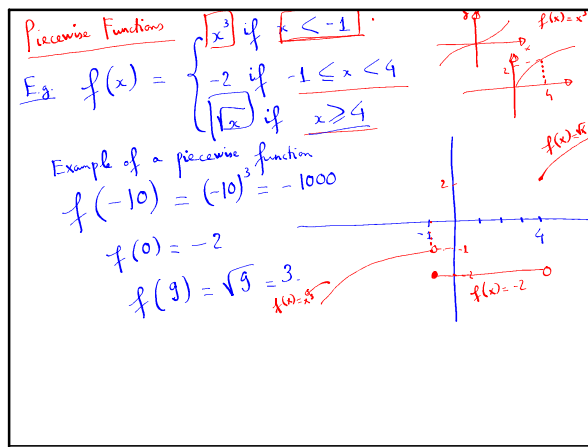
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$f(x) = \frac{(x-2) \div (x-2)}{(x-2) \div (x-2)} = \begin{cases} 1 & \text{if } x \neq 2 \\ \text{undefined} & \text{if } x = 2 \end{cases}$

$f(x) = 1$ if $x \neq 2$

Find the domain and range from the graph

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