2.3. Finding Domain and Range

Objectives : ① Find Domain and Range of functions given
by graphs

② Find Domain of functions given by formulas

E.g.
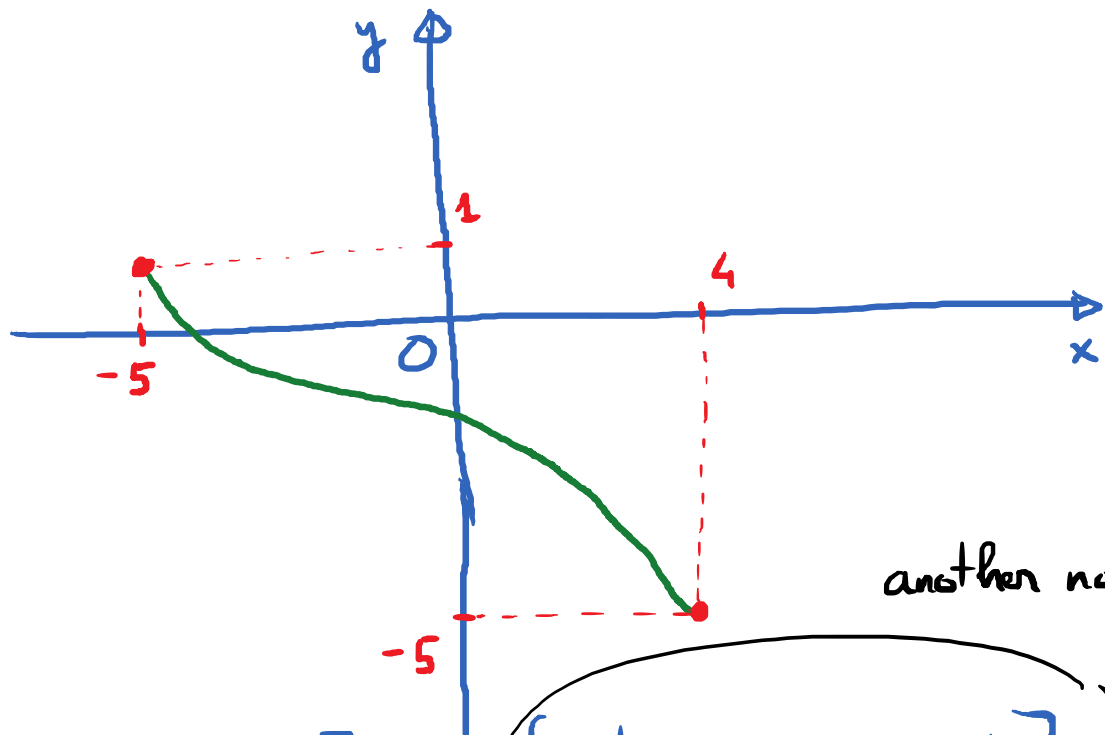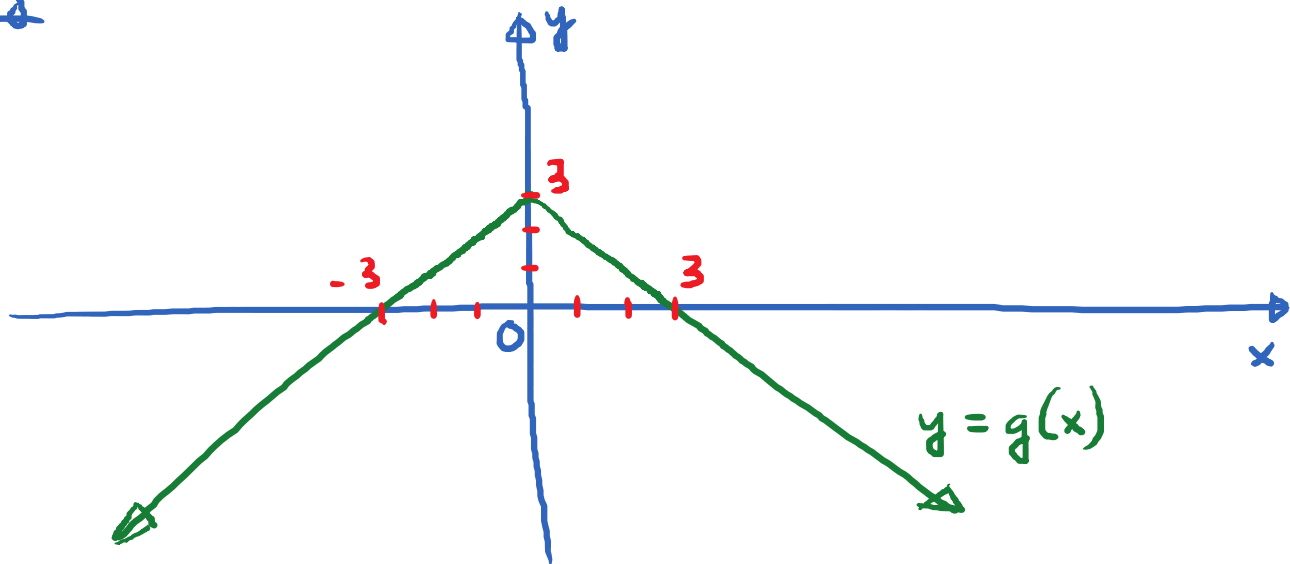

$$\text{Domain} = [-5, 4] = \{x \mid -5 \le x \le 4\}$$

another notation

$$\text{Range} = [-5, 1] = \{y \mid -5 \le y \le 1\}$$

Key : Domain = Projection onto x - axis

Range = Projection onto y - axis .

E.g.

$y = g(x)$
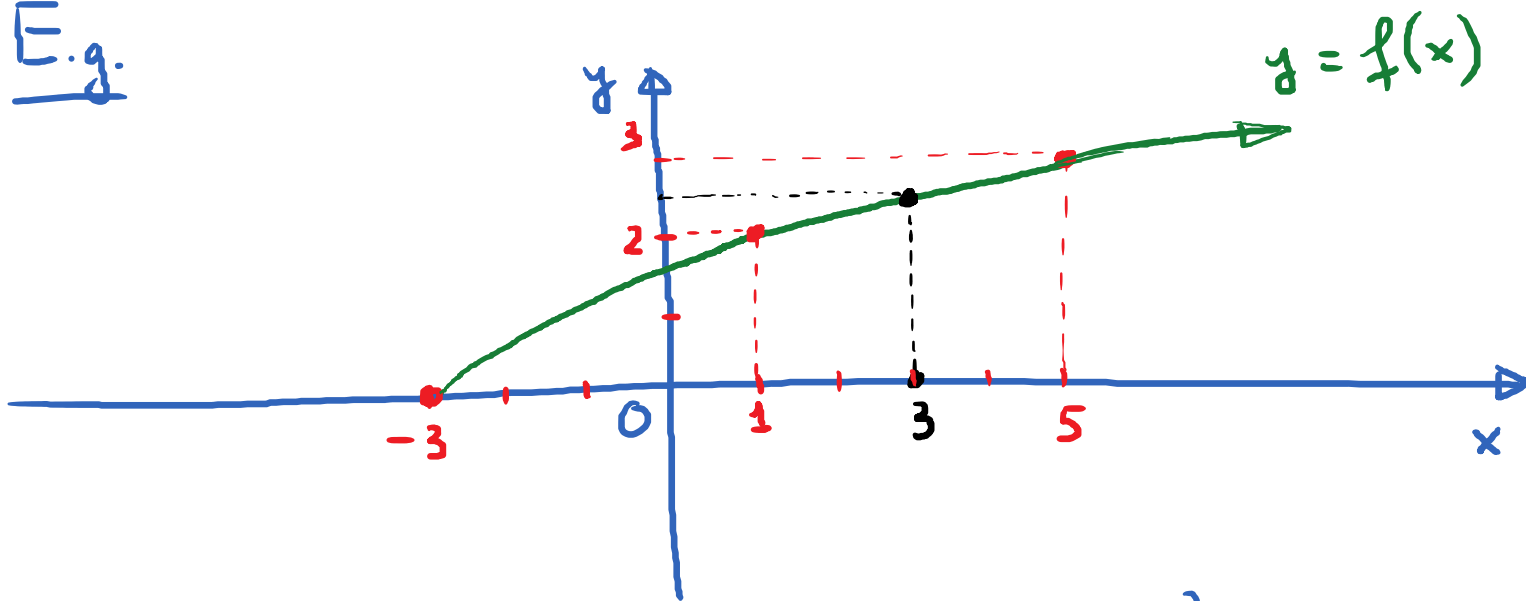
Domain = $(-\infty, \infty)$ = All real numbers.

Range = $(-\infty, 3]$ = $\{ y \mid y \leq 3 \}$
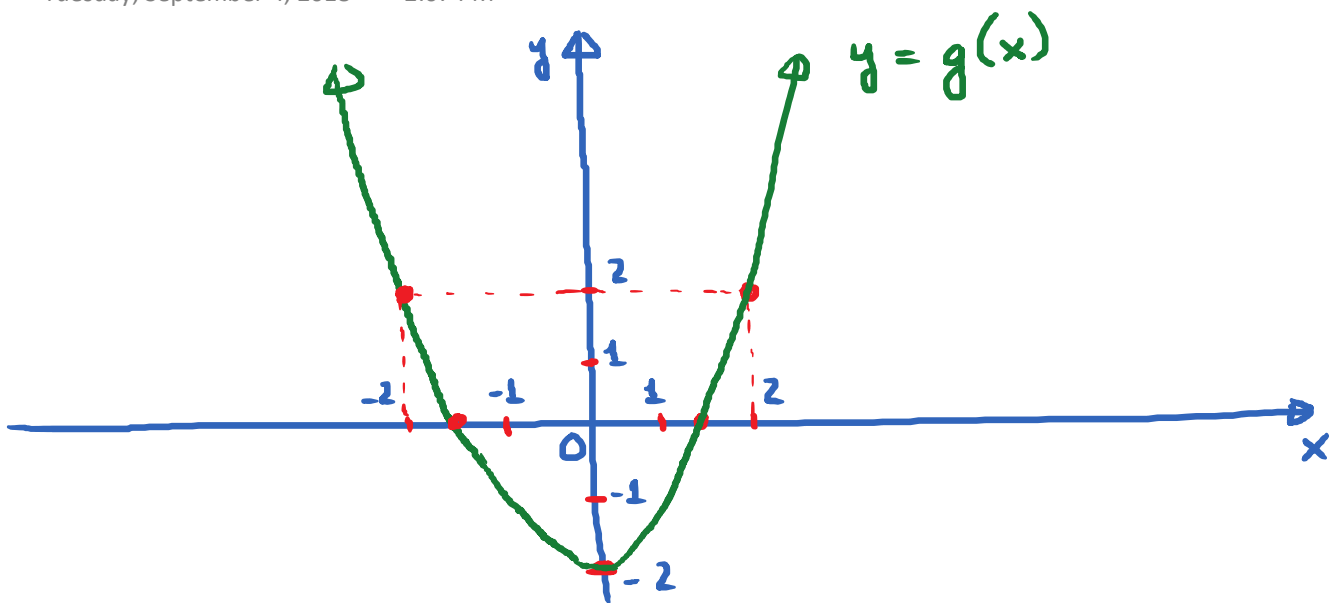
E.g.

$y = f(x)$

* Domain $= [-3, \infty) = \{x \mid x \geq -3\}$

  Range $= [0, \infty) = \{y \mid y \geq 0\}$

* Find $f(-3) = 0$

  $f(3) = 2.5$

* Find x such that $f(x) = 3$

  Ans: $x = 5$.

$y = g(x)$

Find $g(0)$? $g(0) = -2$.

Find x such that $g(x) = 0$?
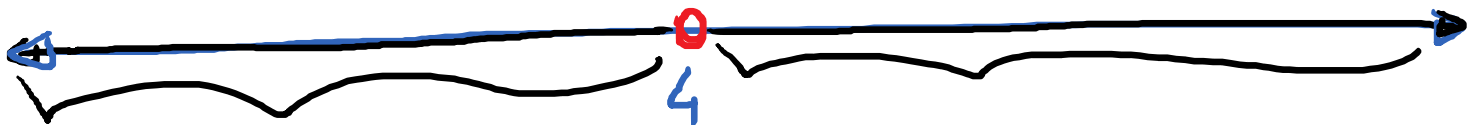
$x = 1.5$ and $x = -1.5$

Find x such that $g(x) = 2$?

$x = 2$ and $x = -2$.

② Find domain given formulas

E.g. $f(x) = \dfrac{5 + x}{x - 4}$

Domain for f is the set of all real numbers except for $x = 4$ because $x = 4$ is the only value of x for which the denominator is 0 and we cannot divide by 0.

In interval notation: $(-\infty, 4) \cup (4, \infty)$

Idea: To find the domain of a function with a denominator, we first set the denominator $= 0$ and then solve for x.

Domain = all real numbers except for the values of x that we just solved for.

E.g. $g(x) = \dfrac{8x - 1}{\boxed{2x + 3}}$. Find domain.

$2x + 3 = 0 \longrightarrow 2x = -3 \longrightarrow x = -\dfrac{3}{2}$.

"bad" value

Domain = $\left(-\infty, -\dfrac{3}{2}\right) \cup \left(-\dfrac{3}{2}, \infty\right)$