Lecture 3 Calculus 1/ BAU University (Fall 22/23)

* Functions : هي علاقة بين متغيرات

variable — constant — variable

Profit = 200 x number of sold items

متغير تابع (dependent variable) — متغير مستقل (independent variable)

$$y = 200x$$

dependent variable — independent variable

$$y = f(x)$$

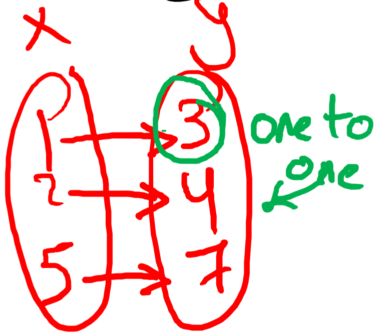
output — input

Range: المدى

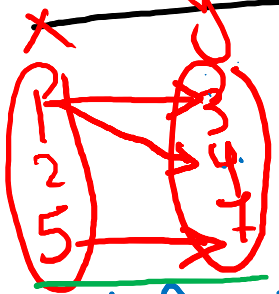
Domain المجال

هل كل علاقة بين متغيرات هي function!

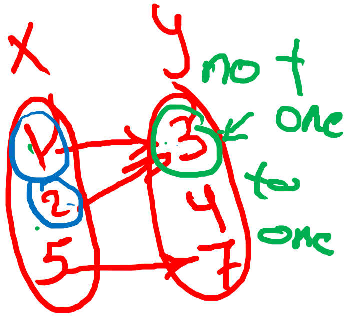
لا ← شرط ال function: أن كل قيمة من x يقابلها قيمة واحدة فقط من y



function



Not function

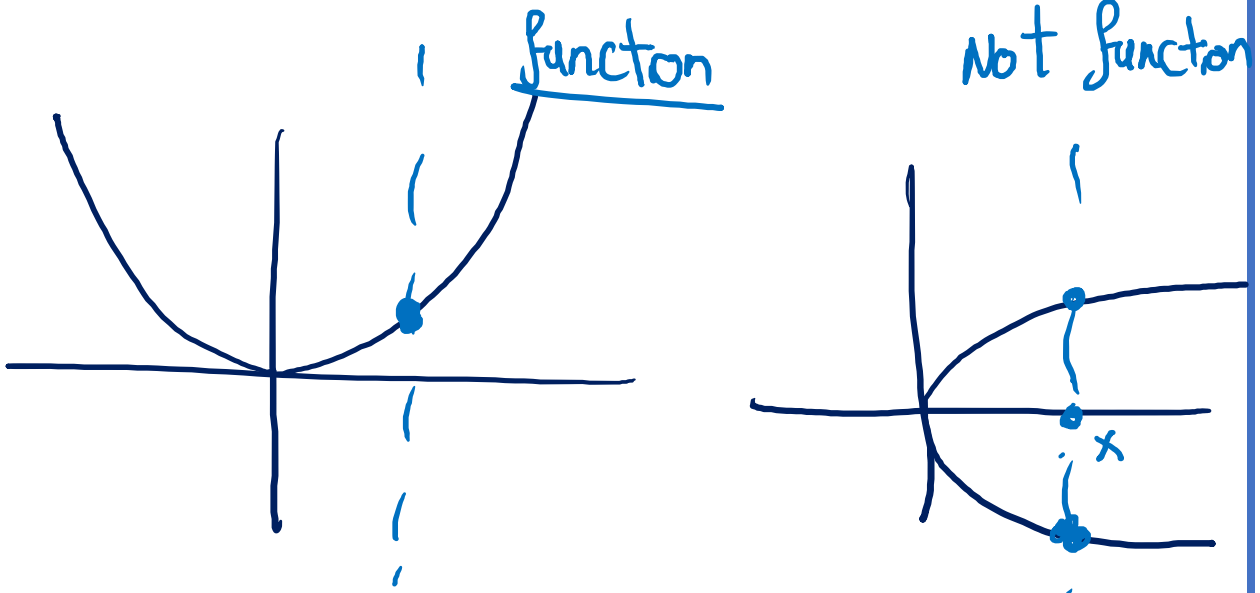


function

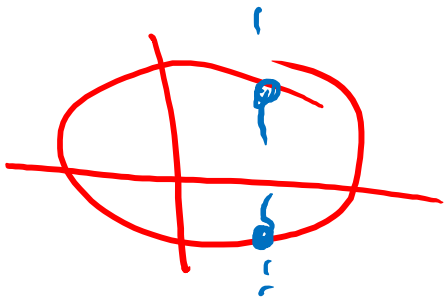
ex $f(x) = \{(3,1), (5,2), (6,3), (5,4)\}$

Not function

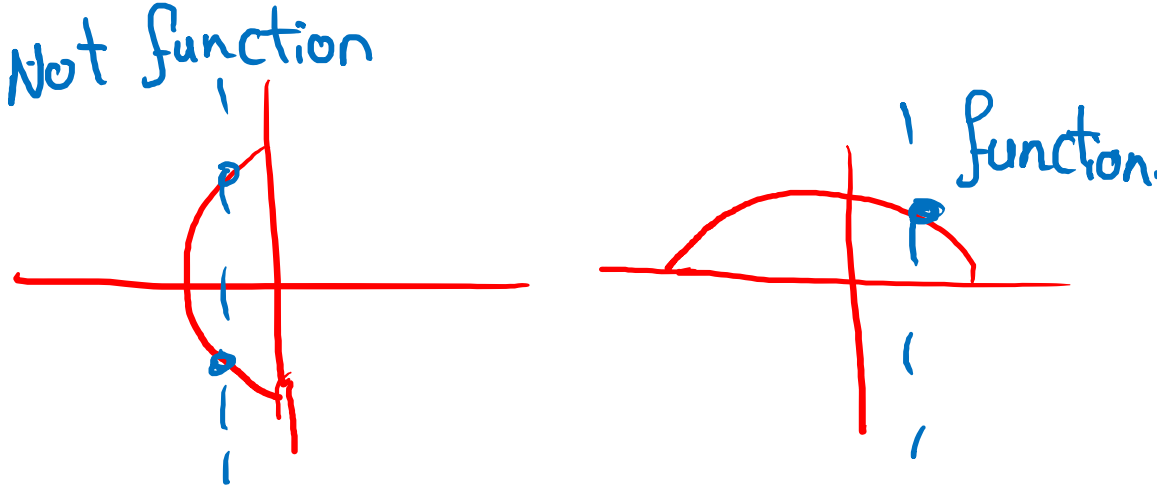
* Vertical line test: to verify if a graph is a function or not.



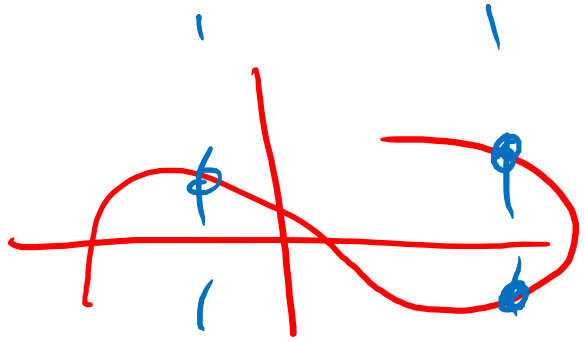
* Circle is not function



* Semi circle:



*



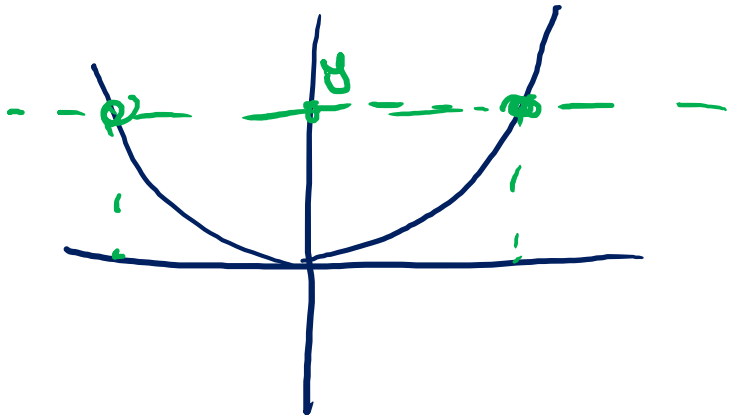
Not function.

* one to one function:

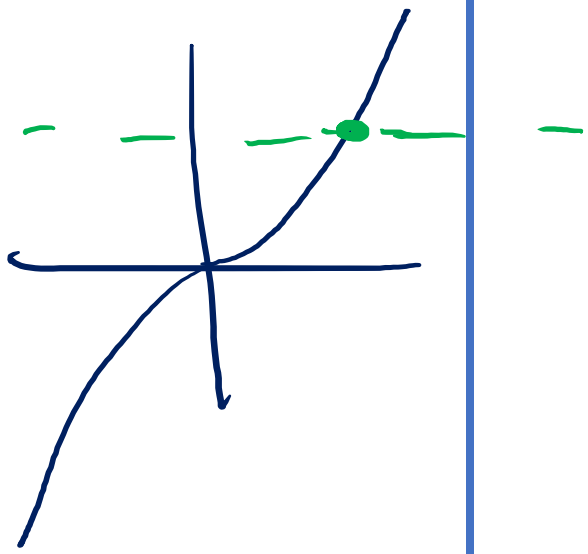
أن كل قيمة من y يقابلها قيمة واحدة فقط من x

* Horizontal line tes:

Not one to one



one to one



* Graphs of function:

Domain: All values of x

Range: All values of y

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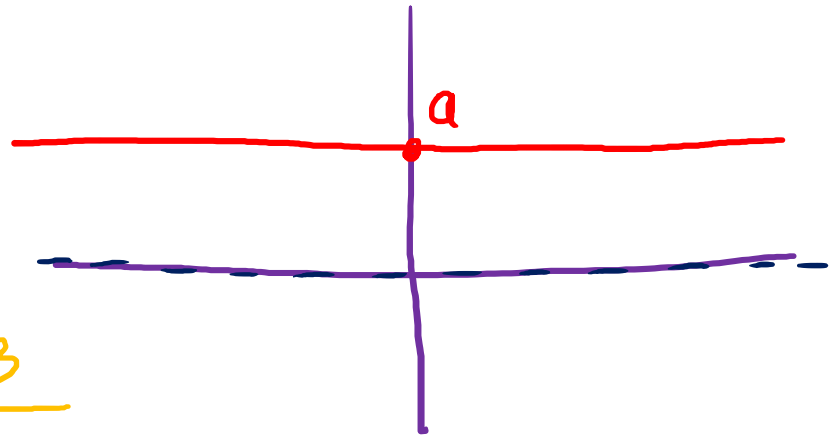
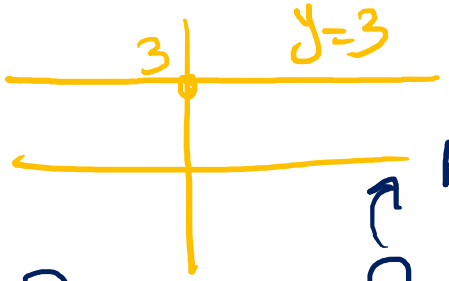
[1] $y = a$



$y = 3$

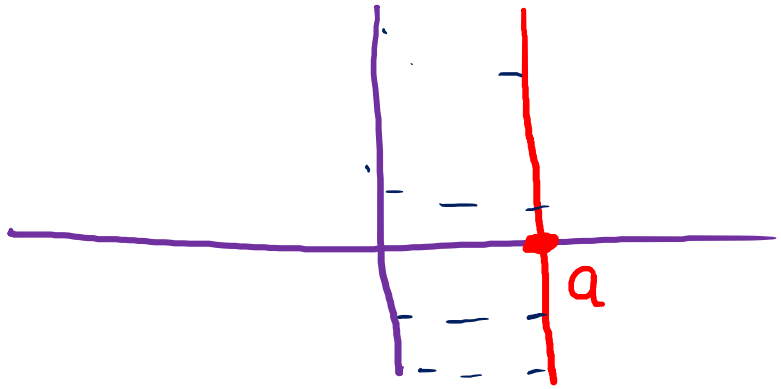


All real numbers

Domain: $R \Rightarrow (-\infty, \infty)$

Range: $\{a\}$

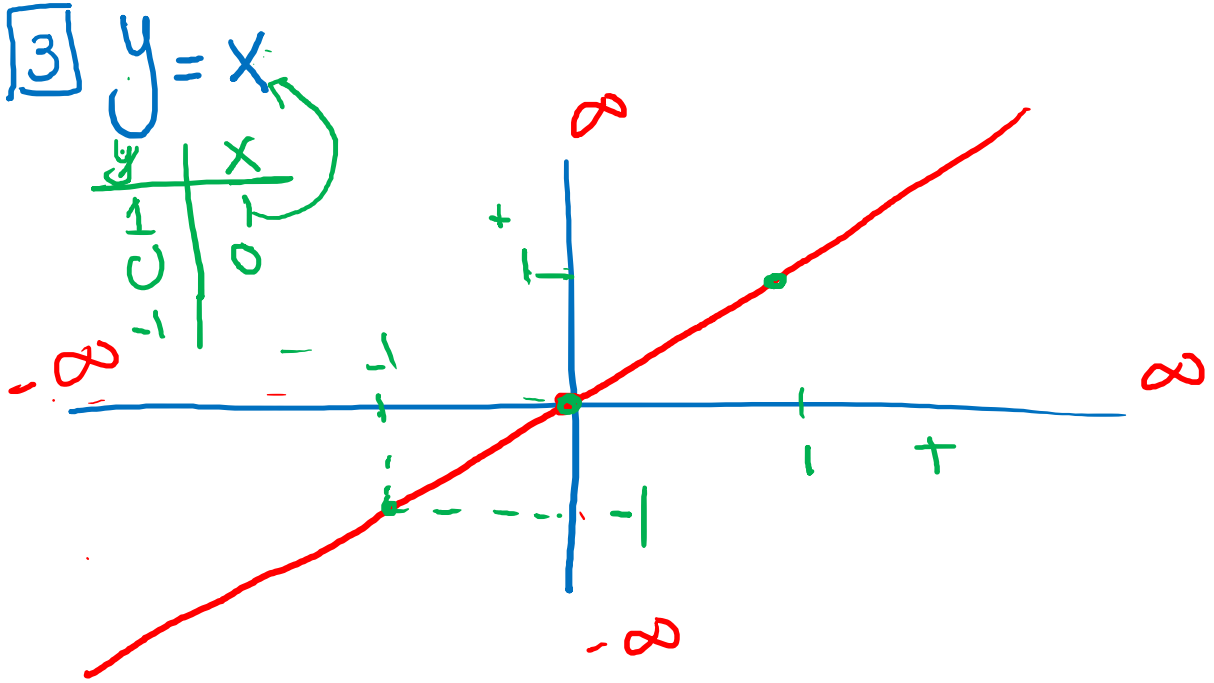
[2] $x = a$



Domain: $\{a\}$

Range: $(-\infty, \infty)$

3 $y = x$

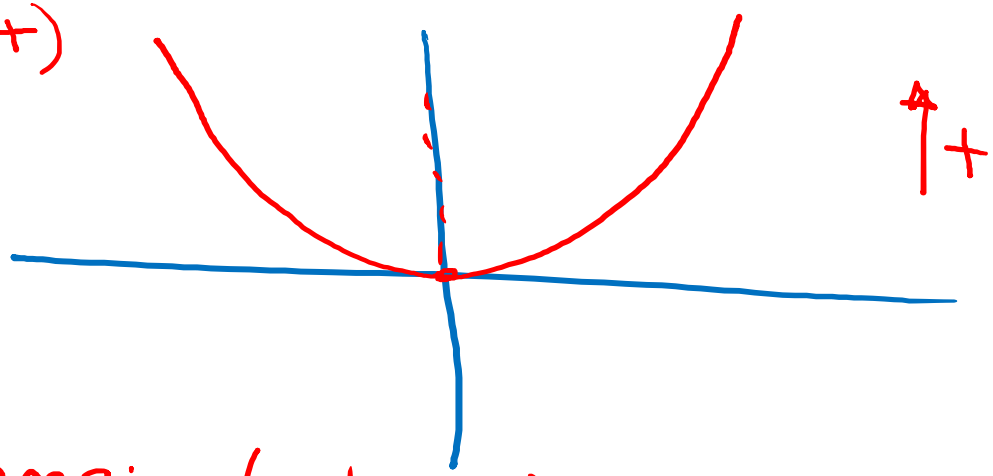


Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

4 $y = x^2$

(+)



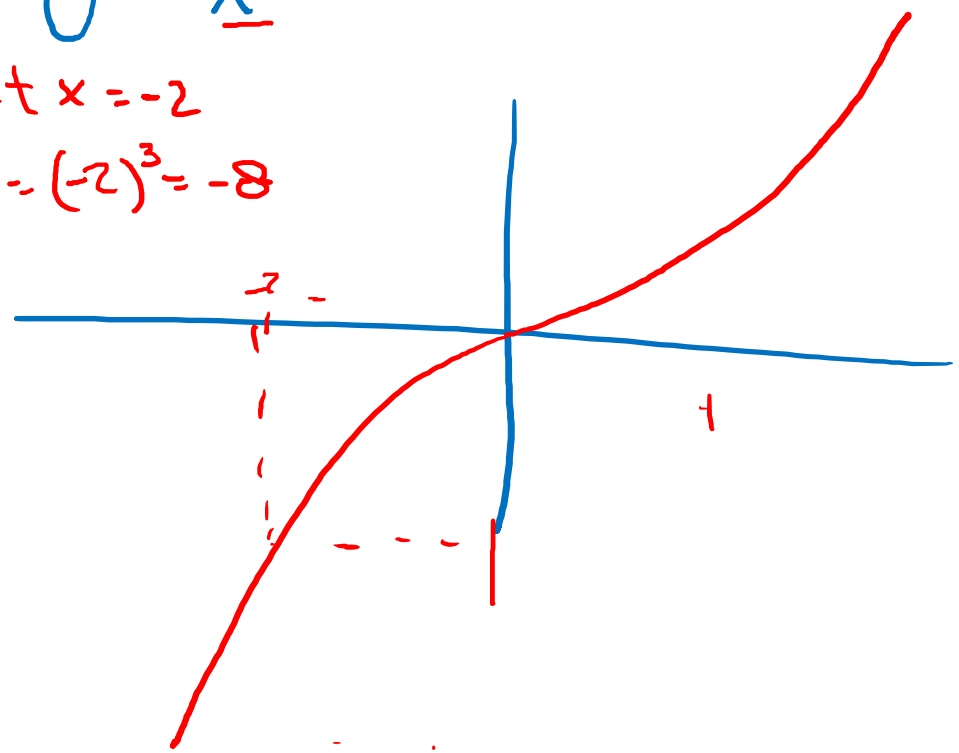
Domain: $(-\infty, \infty)$

Range: $[0, \infty)$

5 $y = x^3$

at $x = -2$

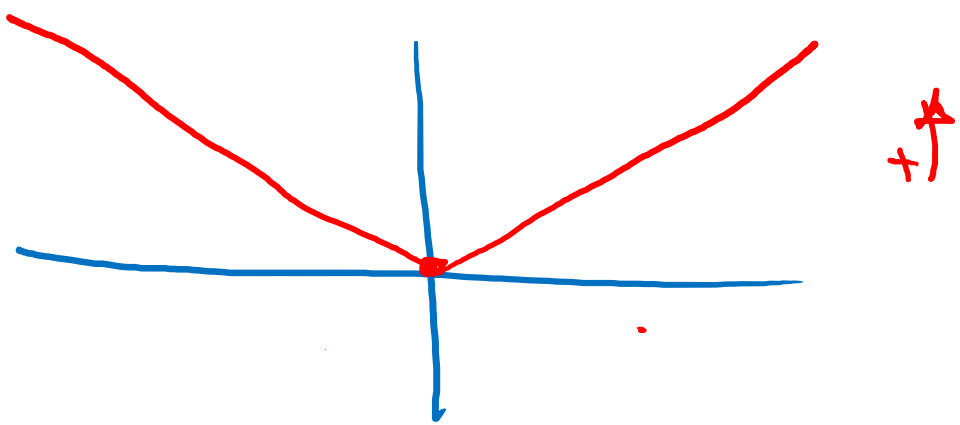
$y = (-2)^3 = -8$



Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

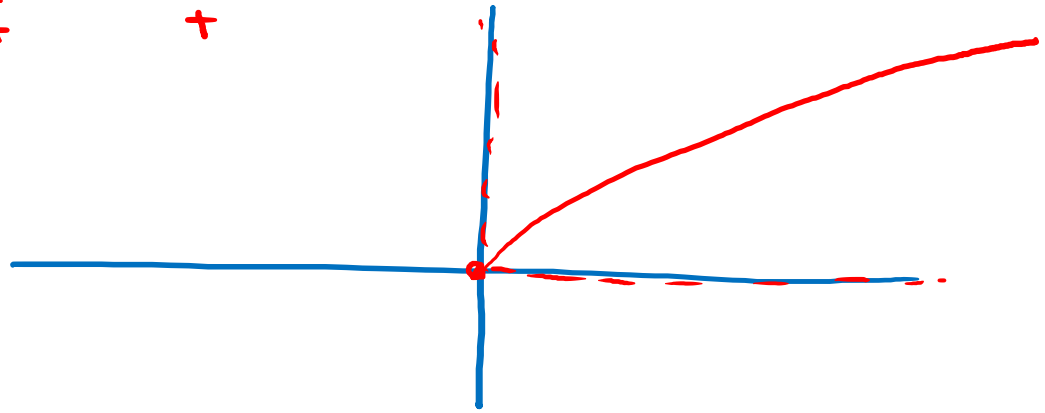
6 $y = |x|$



Domain: $(-\infty, \infty)$

Range: $[0, \infty)$

7) $y = \sqrt{x}$ $\quad 3 = \sqrt{9}$ $\quad \sqrt{2} = \sqrt{4}$



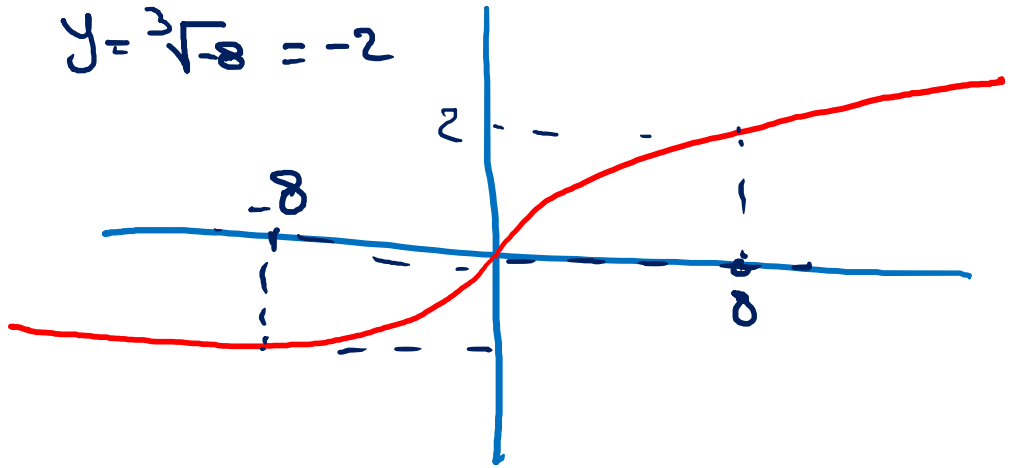
Domain: $[0, \infty)$

Range: $[0, \infty)$

8) $y = \sqrt[3]{x}$

$y = \sqrt[3]{8} = 2$

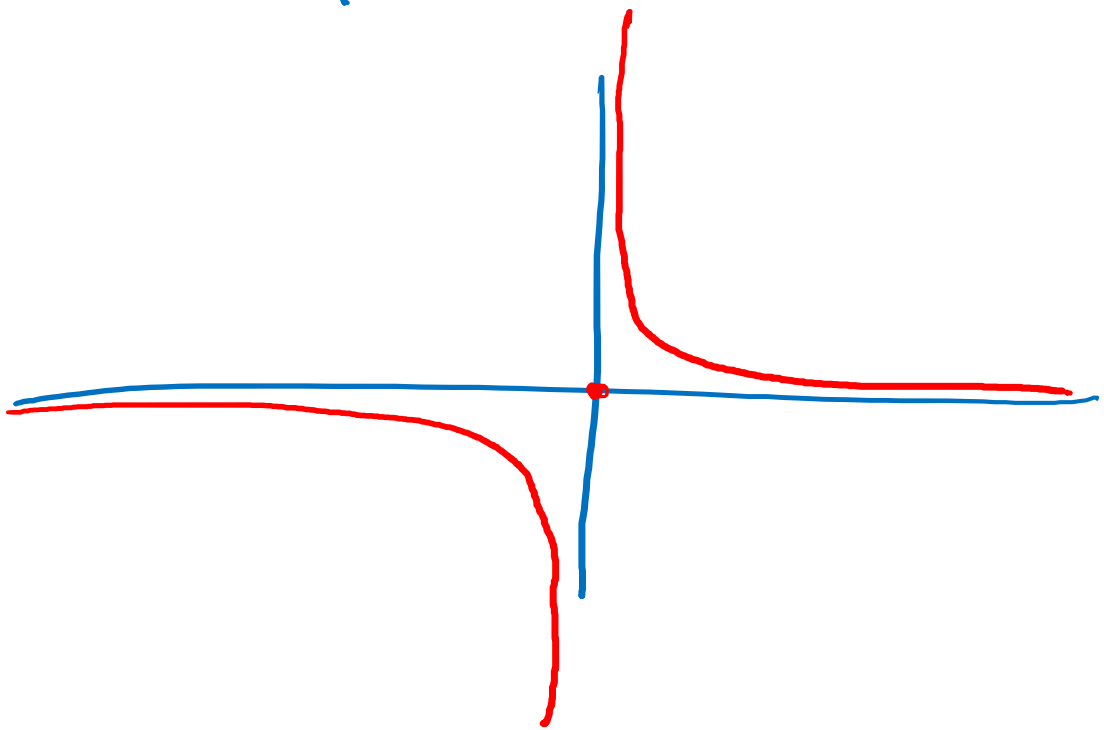
$y = \sqrt[3]{-8} = -2$



Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

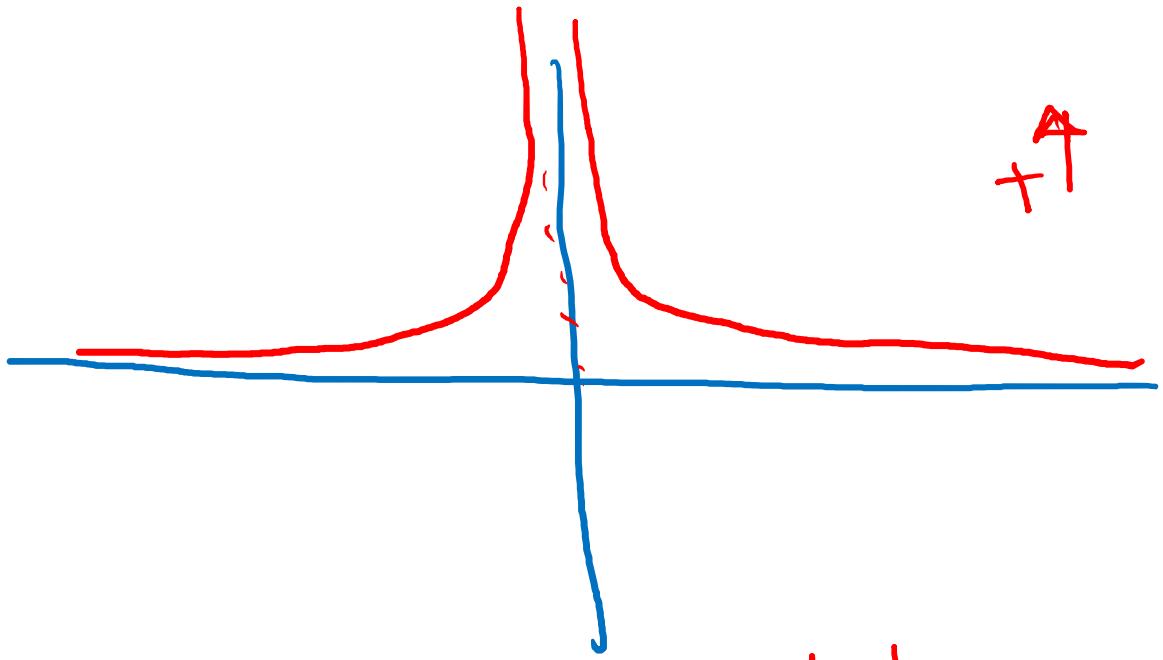
[9] $y = \frac{1}{x}$ $x \neq 0$



Domain : $R - \{0\} \Rightarrow (-\infty, 0) \cup (0, \infty)$

Range : $R - \{0\} \Rightarrow (-\infty, 0) \cup (0, \infty)$

[10] $y = \frac{1}{x^2}$



Domain: $R - \{0\}$

Range: $(0, \infty)$

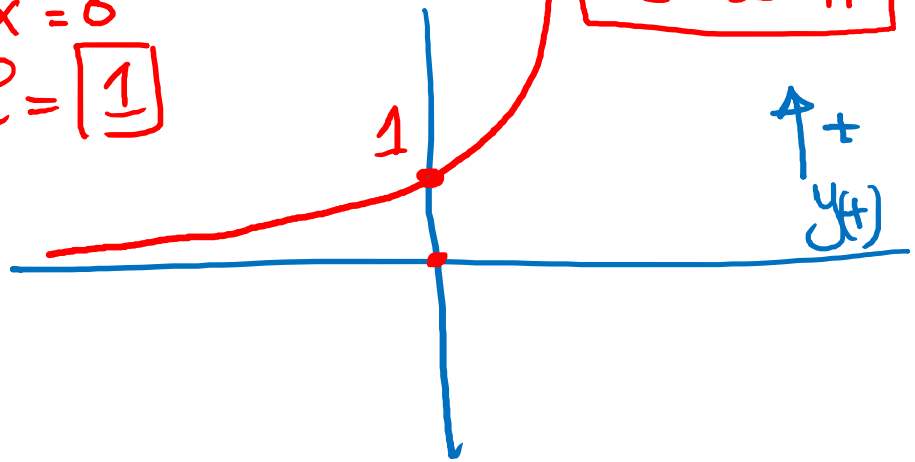
11 $y = e^x$

$e = 2.7171717\ldots$

$e = 2.71$

at $x = 0$

$y = e^0 = \boxed{1}$

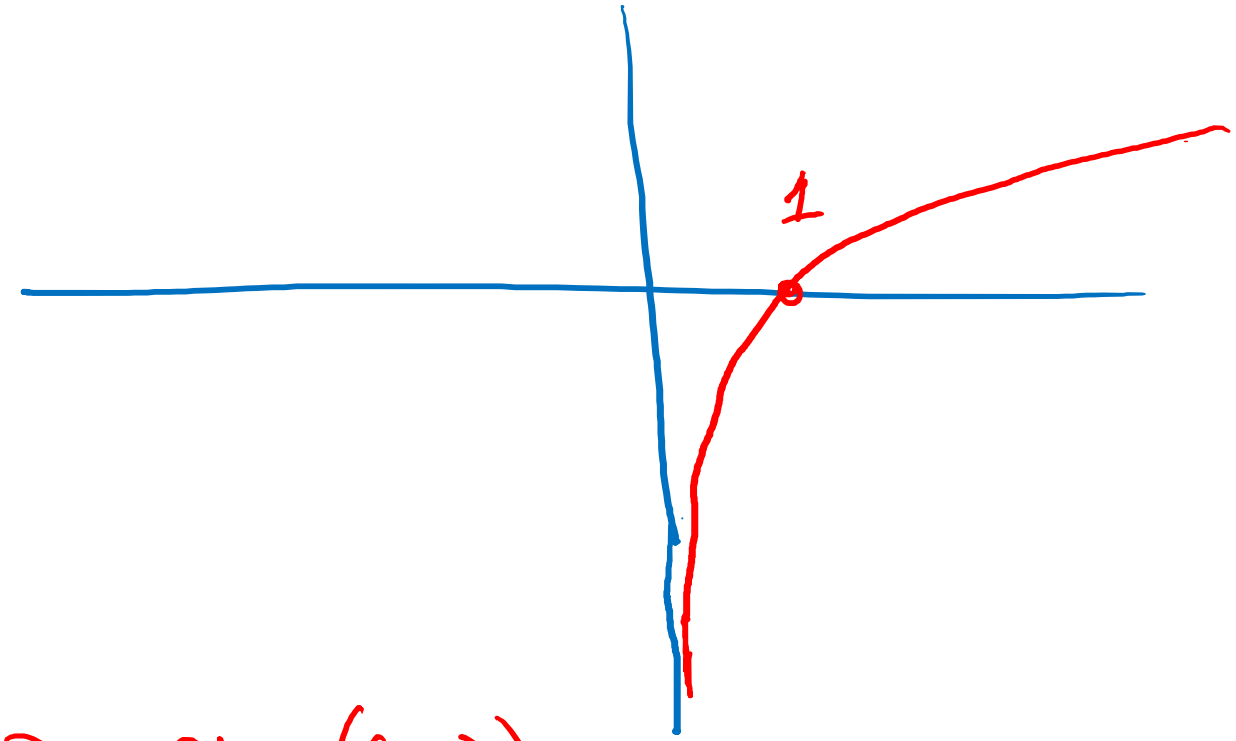


$2^2 = 4$, $2^{-2} = \frac{1}{2^2} = \frac{1}{4}$

Domain: $(-\infty, \infty)$

Range: $(0, \infty)$

12 $y = \ln x$



Domain: $(0, \infty)$

Range: $(-\infty, \infty)$