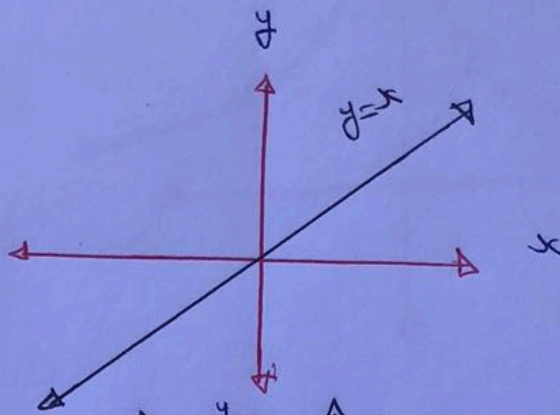


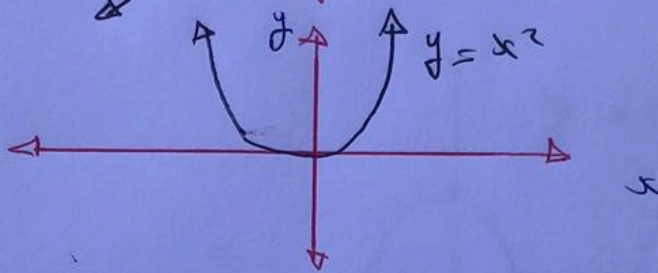
1.3 Graphing

Recall that

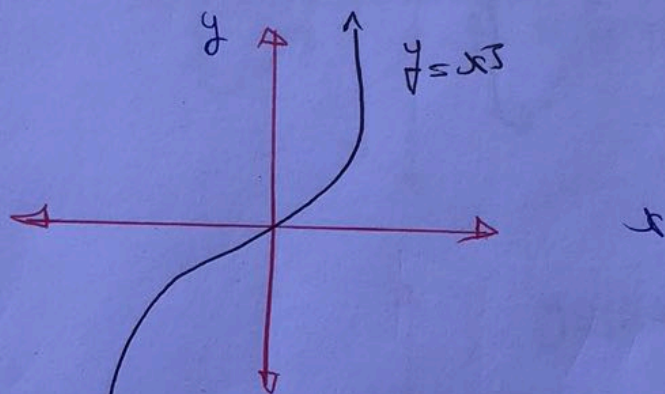
① $y = x$



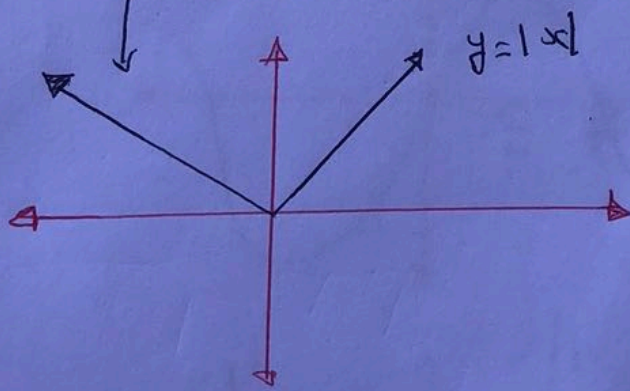
② $y = x^2$



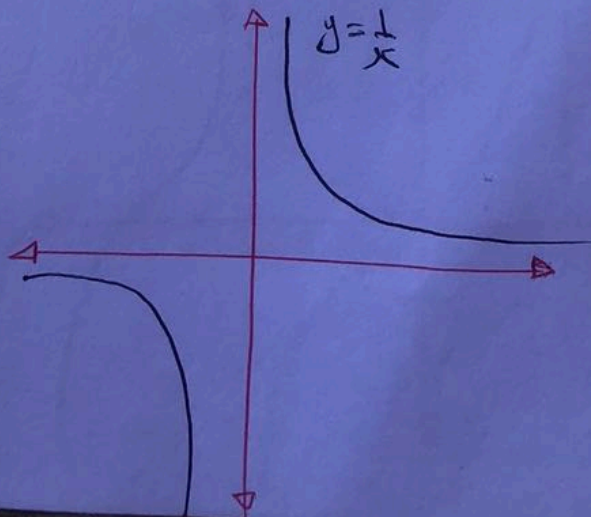
③ $y = x^3$



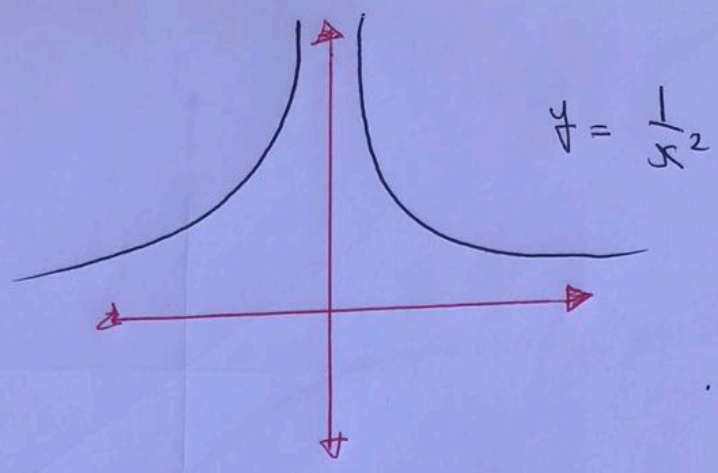
④ $y = |x|$



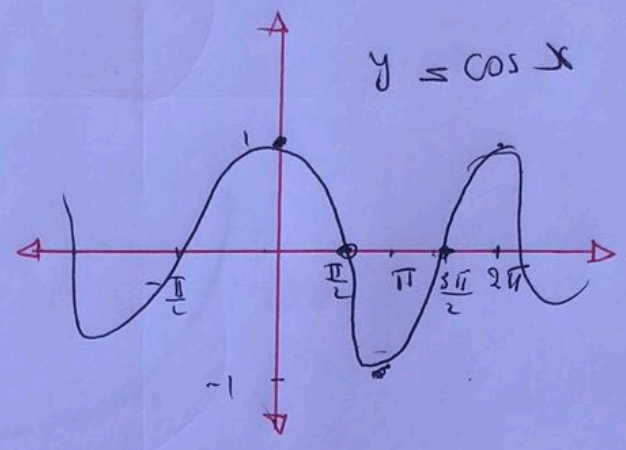
⑤ $y = \frac{1}{x}$



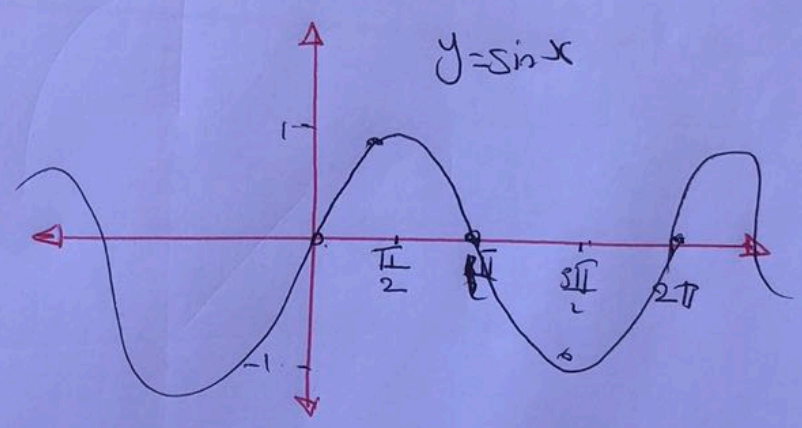
⑥ $y = \frac{1}{x^2}$



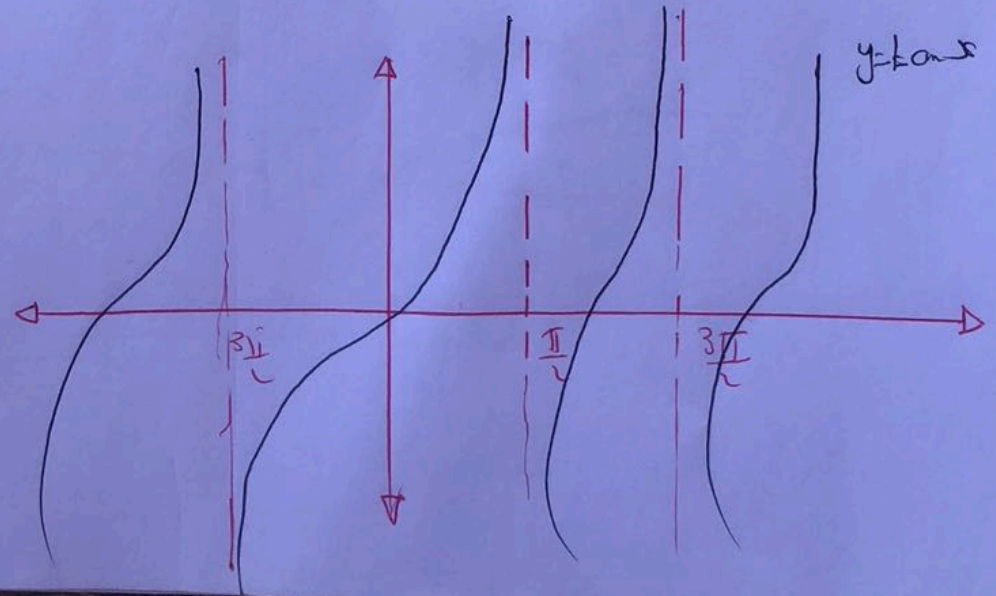
⑦ $y = \cos x$



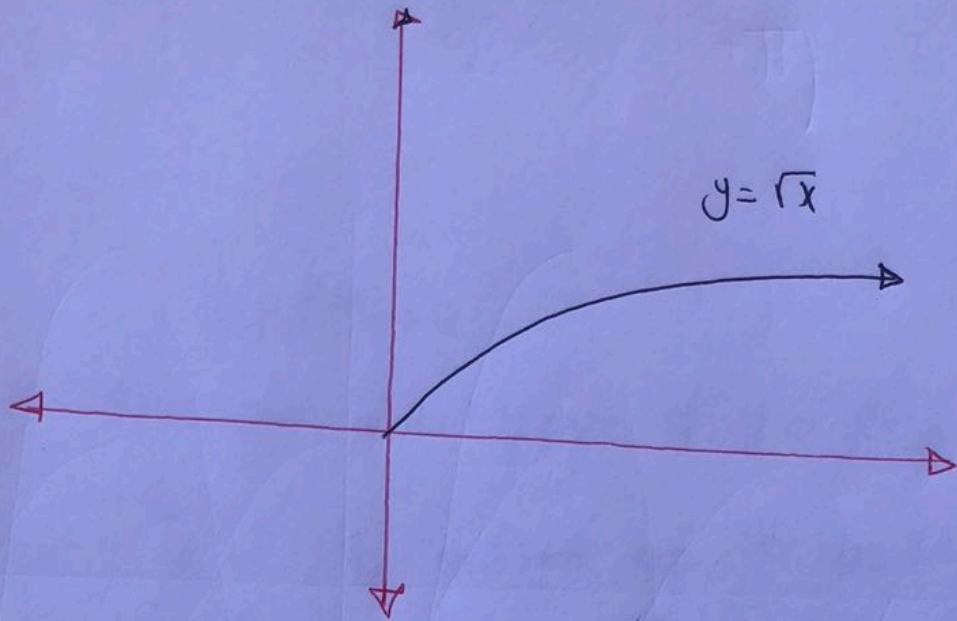
⑧ $y = \sin x$



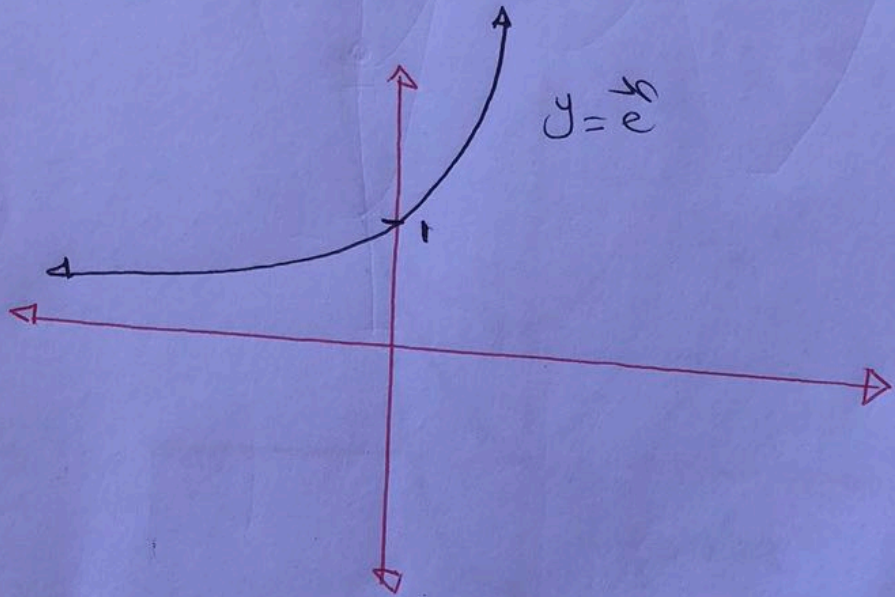
⑨ $y = \tan x$



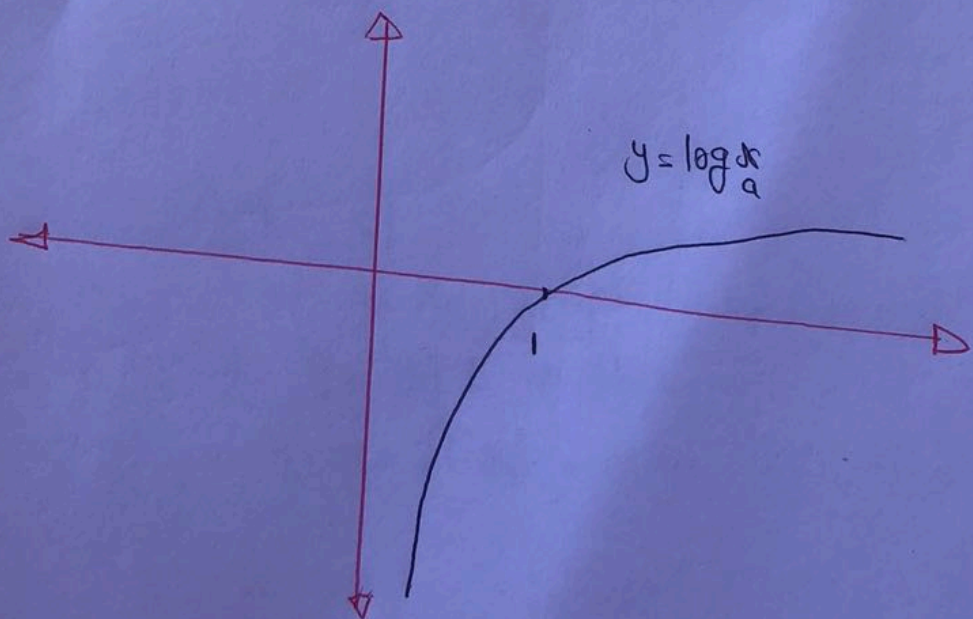
⑩ $y = \sqrt{x}$



⑪ $y = e^x$



⑫ $y = \log_a x$



1.3.1 Graphing and Basic Transformations of Functions (3)

Definition:

The graph of

$$y = f(x) + a$$

is a **vertical** translation of the graph of $y = f(x)$.

* If $a > 0$, then $y = f(x)$ is shifted up a units.

* If $a < 0$, the graph of $y = f(x)$ is shifted down $|a|$ units.

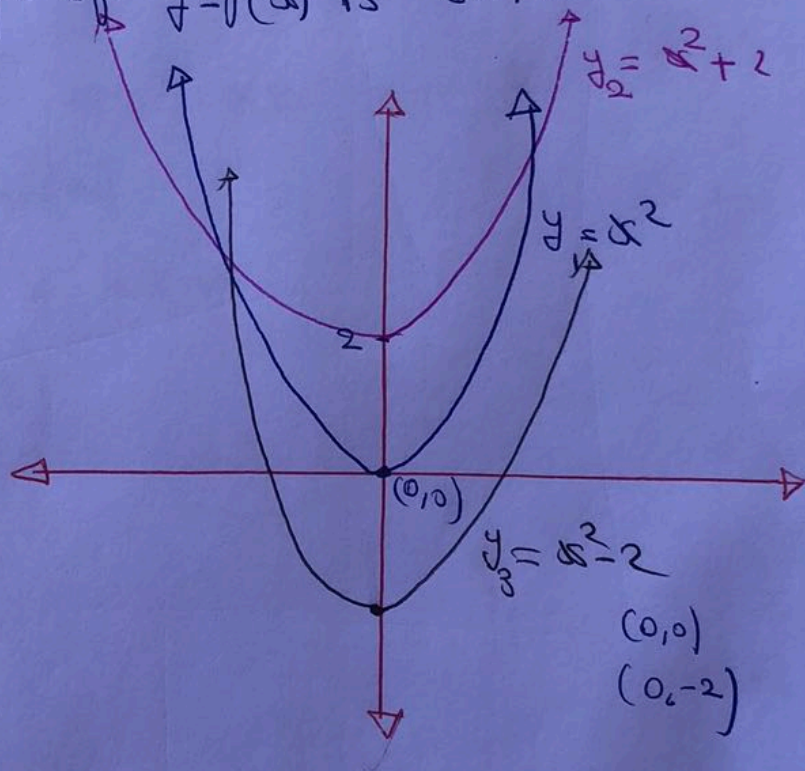
Example:

Graph:

$$y = x^2$$

$$y_2 = x^2 + 2$$

$$y_3 = x^2 - 2$$



(0,0)
(0,2)

(0,0)
(0,-2)

Definition:

The graph of $y = f(x - c)$

is a **horizontal** translation of the graph of $y = f(x)$

* If $c > 0$, the graph of $y = f(x)$ is shifted c units to the right

* If $c < 0$, the graph of $y = f(x)$ is shifted $|c|$ units to the left

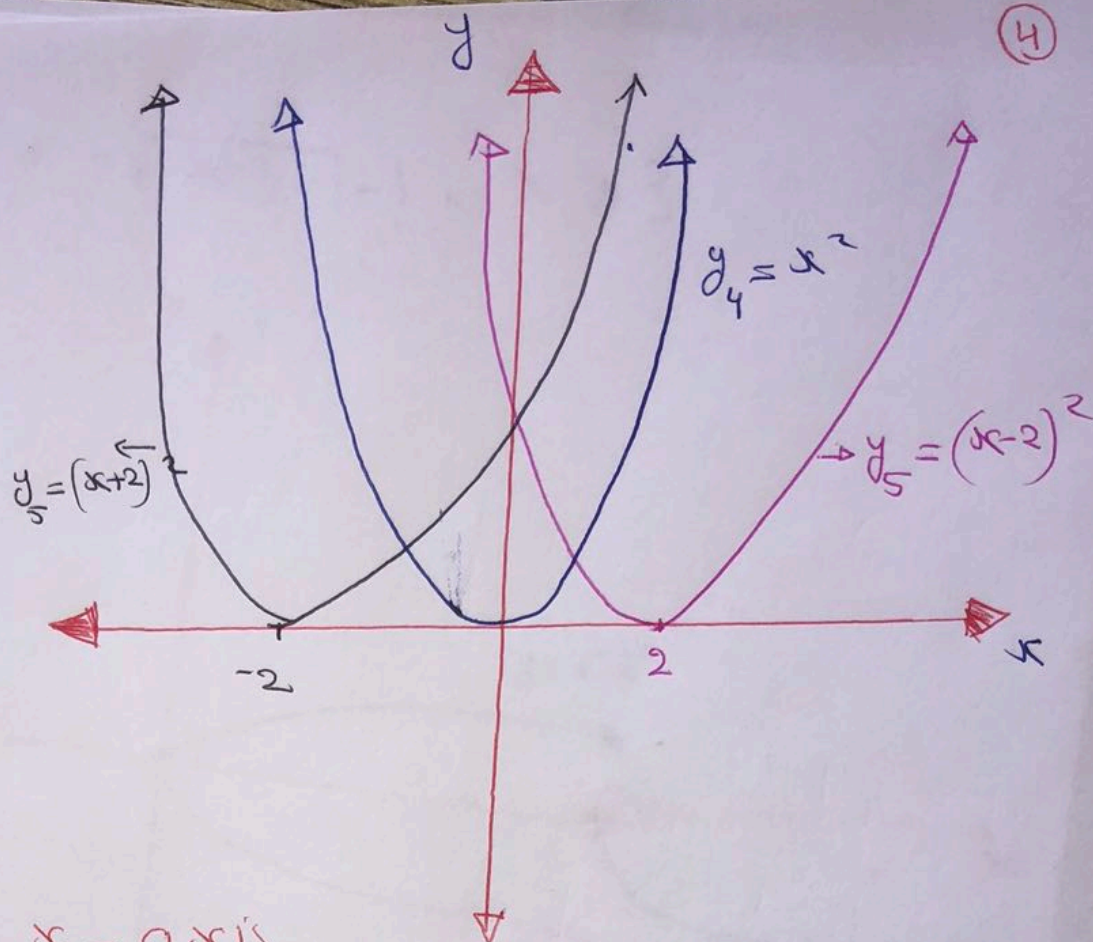
Example:

Graph:

$$y_4 = x^2$$

$$y_5 = (x-2)^2$$

$$y_6 = (x+2)^2$$



Reflection about x -axis

$$f(x) \rightarrow -f(x)$$

Reflection about y -axis

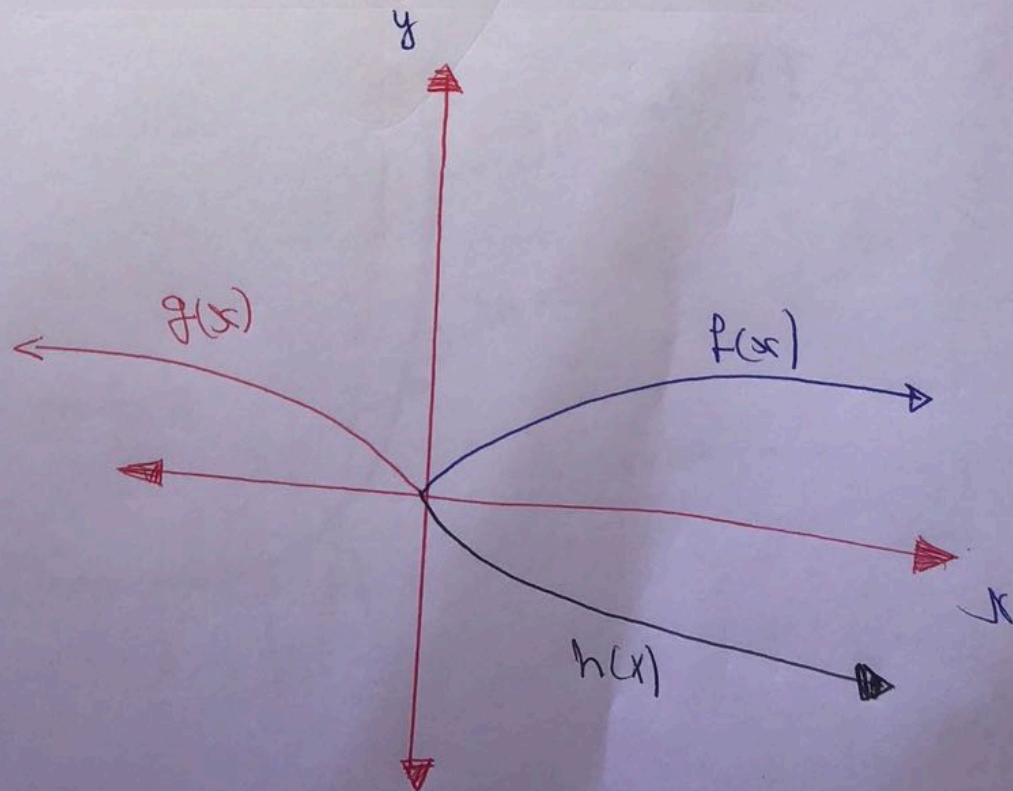
$$f(x) \rightarrow f(-x)$$

Example:

$$f(x) = \sqrt{x}$$

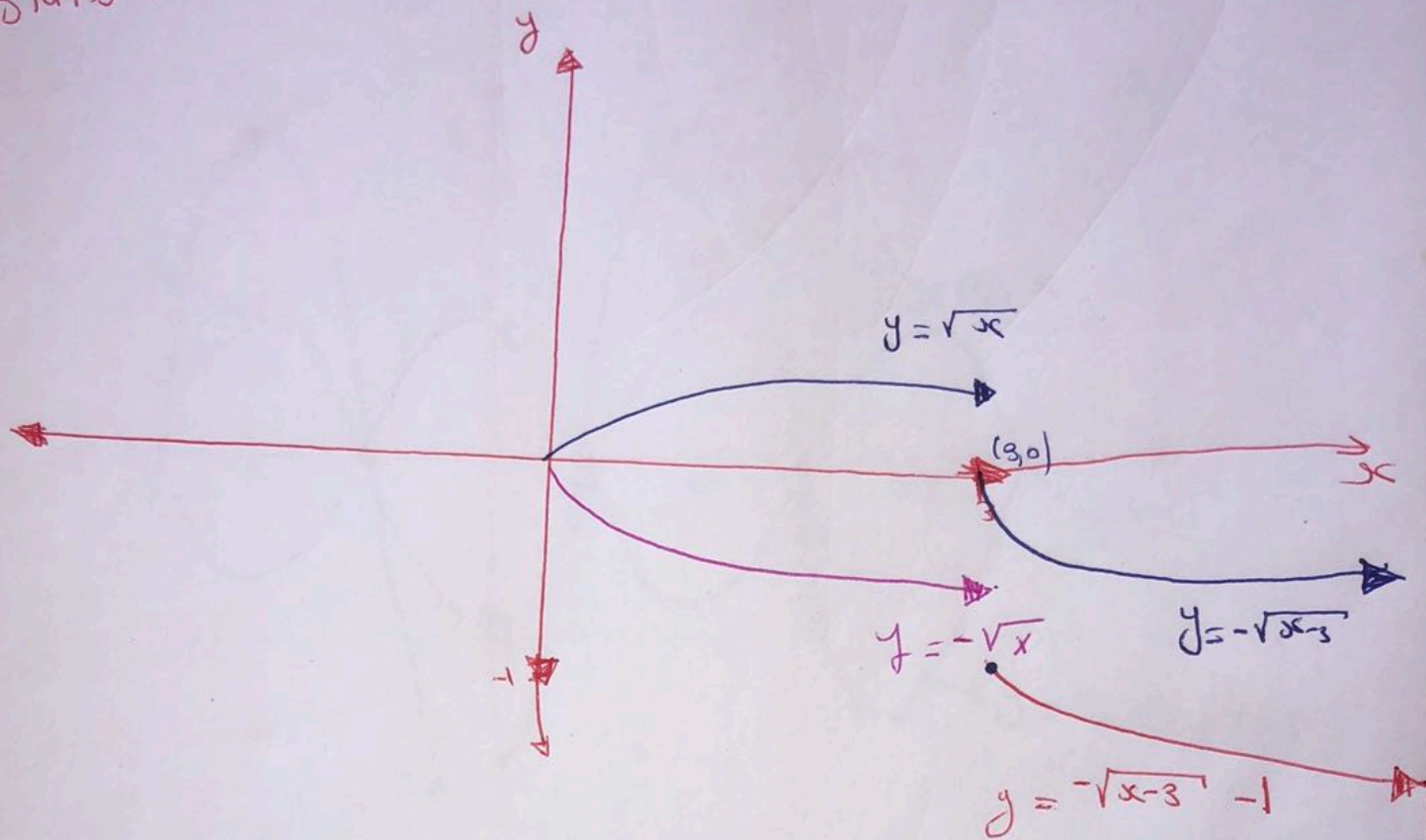
$$g(x) = \sqrt{-x}$$

$$h(x) = -\sqrt{x}$$



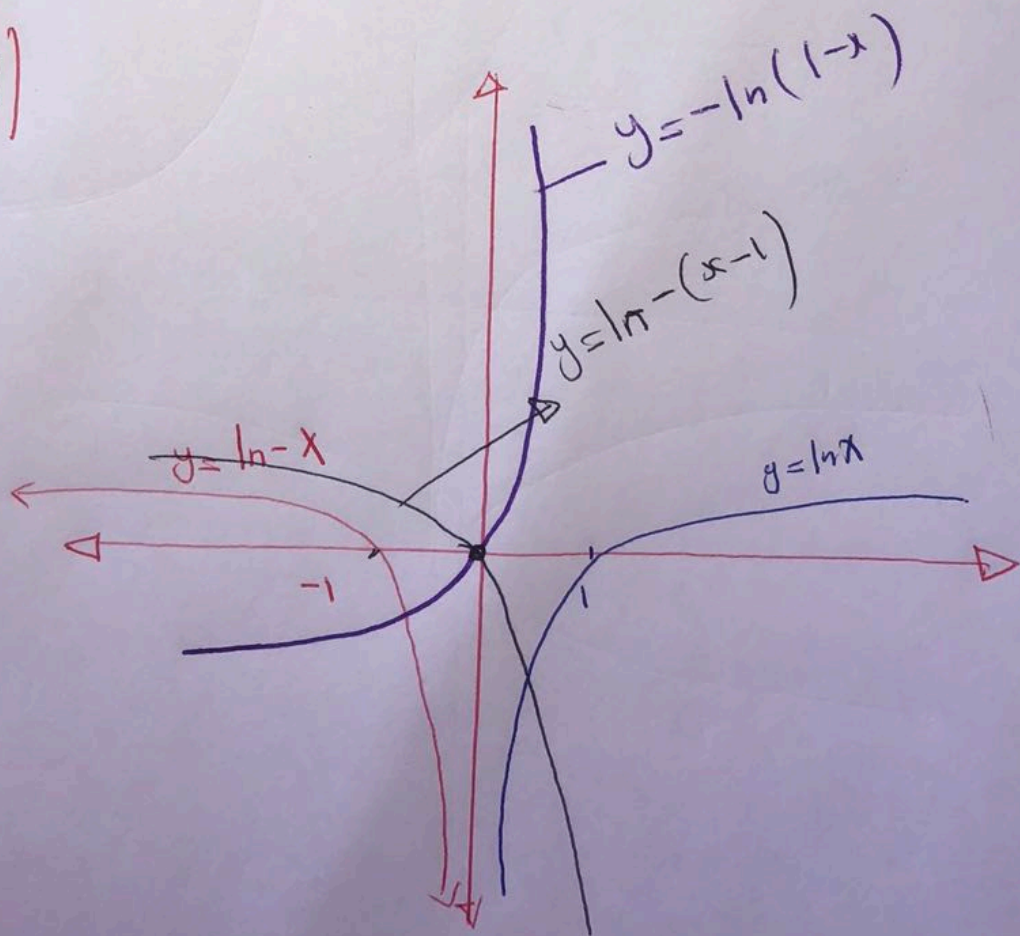
Example: Graph $y = -\sqrt{x-3} - 1, x \geq 3$

Solution.



\boxed{Ex} $y = -\ln(1-x)$

$y = -\ln(-(x-1))$



Example : Graph

$$y = 2 \cos(x + \pi)$$

