

③ IS the given equation a function? why?

① $y = \begin{cases} ax+b & \text{if } x \geq 0 \\ b & \text{if } x < 0 \end{cases}$

Case: 1 $y = ax+b \quad x \geq 0$

In the given equation $y = ax+b$ where $x \geq 0$ for the equation to be a function there should be only one distinct value of y for any value of x

$$y = ax+b$$

Let consider x value are greater than or equal to 0

$$x=1, \quad y=a+b$$

$$x=2 \quad y=2a+b$$

We are getting different value of y for any value of x , so, $y = ax+b$ is a function

Case: 2 If the x less than 0 $x < 0$

$y = b$ is a linear equation

The function relates each input to exactly one output. In this case for each value of x there is a unique value of y .

$$y = \begin{cases} ax+b & \text{if } x \geq 0 \\ b & \text{if } x < 0 \end{cases} \quad \text{is a function}$$

⑥ $y^2 = ax^2 + b \quad a > b > 0$

$$y = \sqrt{ax^2 + b}$$

$$y = +\sqrt{ax^2 + b} \text{ or } -\sqrt{ax^2 + b}$$

Since the equation $y = \sqrt{ax^2 + b}$ has two possible solutions for y , both positive and negative square roots of $(ax^2 + b)$, for any given x , it fails to meet the essential criteria for a function, thus making it not a valid function.

$$y^2 = ax^2 + b \quad \text{is not a function}$$

④ Given $f(x) = (9-x)/x$, $g(x)$ is the reflection of the function $f(x)$ about $y=x$

① find $g(x)$

The reflection of the function $f(x)$

we need swap x and y in the $f(x)$ function

$$x = \frac{(9-x)}{x}$$

$$x = \frac{(9-y)}{y}$$

$$xy = 9-y$$

$$y + xy = 9$$

$$y(1+x) = 9$$

$$y = \frac{9}{(1+x)}$$

when $y=x$ is

$$\boxed{g(x) = \frac{9}{1+x}}$$

(b) verify if $g(f(x))=x$

sol: given $g(x)=q/(x+1)$ and $f(x)=(q-x)/x$

$$g(f(x)) = g\left(\frac{q-x}{x}\right)$$

$$g(f(x)) = \frac{q}{\frac{q-x}{x} + 1}$$

$$g(f(x)) = \frac{q}{\frac{q-x+x}{x}}$$

$$g(f(x)) = \frac{q}{q/x}$$

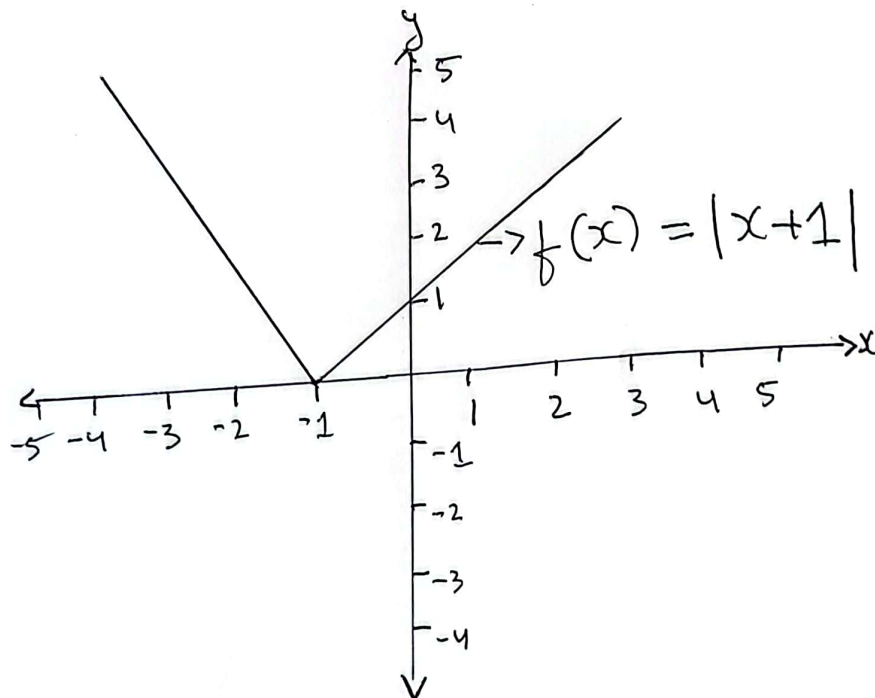
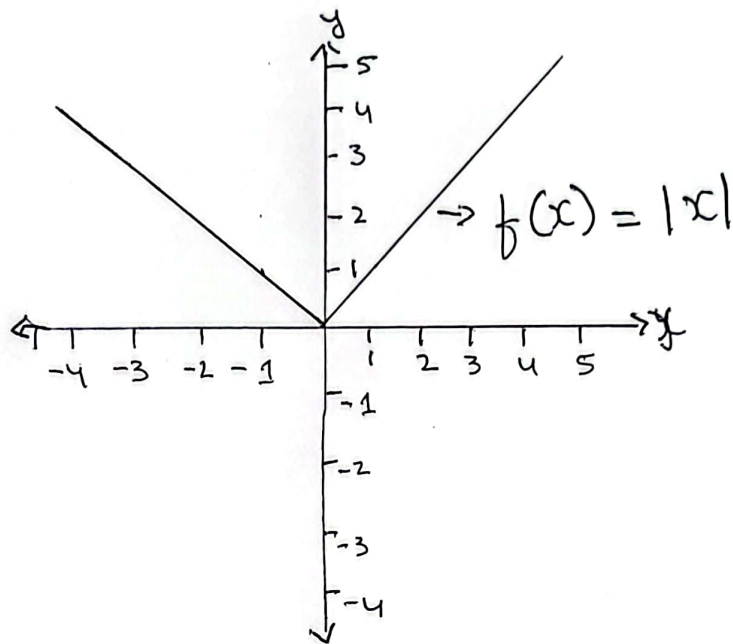
$$g(f(x)) = \frac{qx}{q}$$

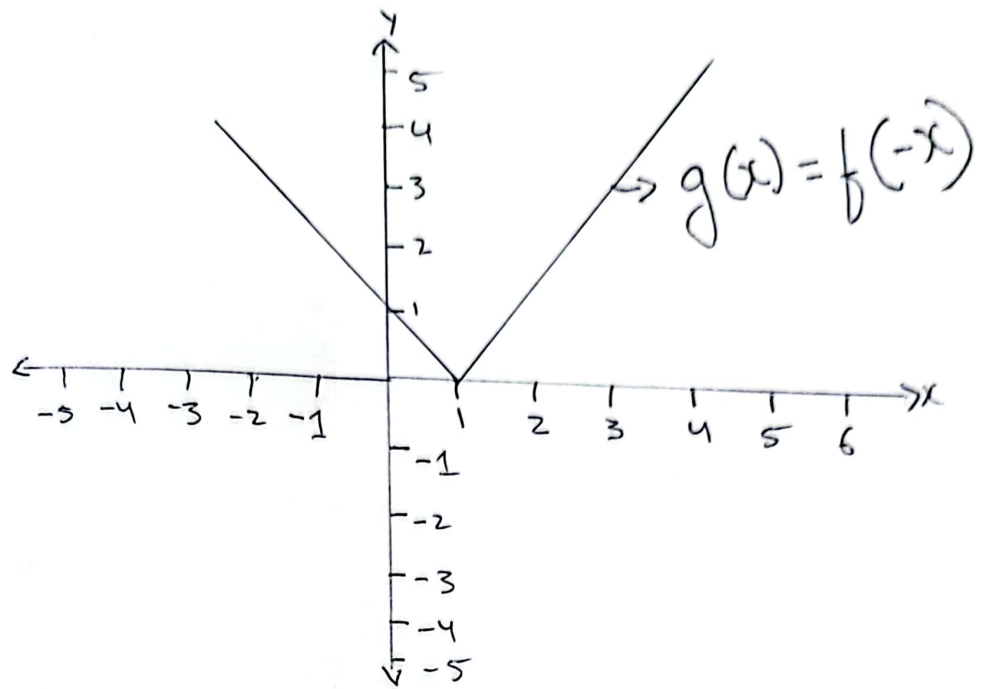
$$\boxed{g(f(x)) = x}$$

hence proved verified

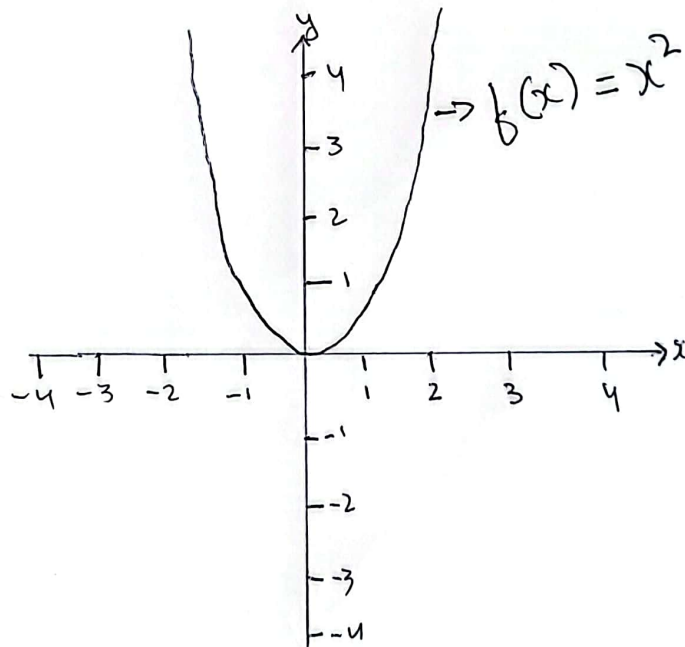
⑤ use transformations to sketch the graph of the following functions

① $f(x) = |x+1|$ $g(x) = f(-x)$

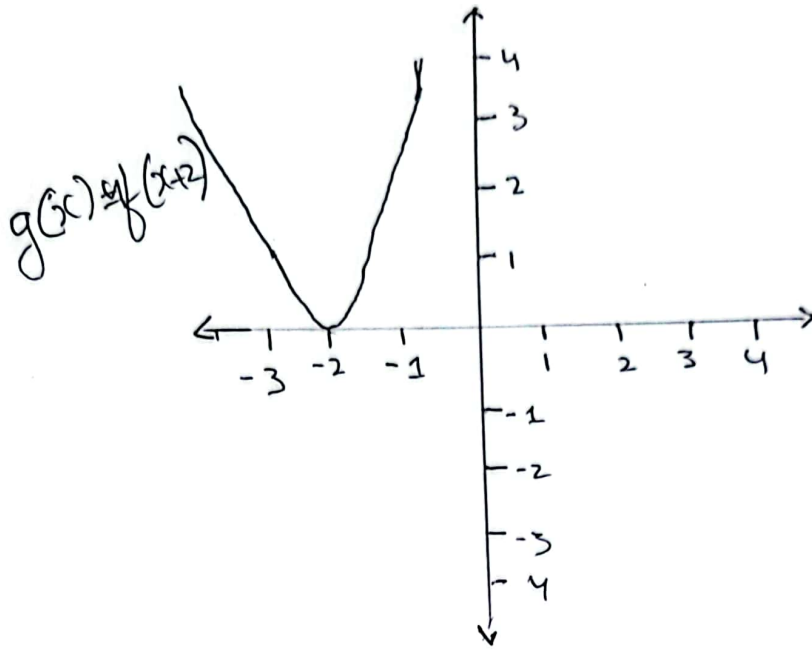




⑥ $f(x) = x^2$ $g(x) = 4f(x+2)$



$$g(x) = 4f(x+2)$$



$f(x)$ is translated by 2 units to right and stretched by 4 units

⑥ Find transformations functions

① The graph of $f(x) = [(x-1)^2 - 1]$ is flipped about the y-axis and then stretched by 2 in the y direction find the equation of the new graph of $g(x)$

sol: When we flip a graph about the y-axis we need replace the x with $-x$

$$f(x) = [(x-1)^2 - 1]$$

~~we~~ replacing x with $-x$

$$f(-x) = [(-x-1)^2 - 1]$$

The graph stretched by 2 in the y direction so we need to multiply the expression by 2

substitute the equation of $f(-x)$ into $g(x)$

$$g(x) = 2 * f(-x)$$

$$g(x) = 2 * [(-x-1)^2 - 1]$$

$$= 2 * [(x+1)^2 - 1]$$

$$= 2 * [x^2 + 2x + 1 - 1]$$

$$= 2 * [x^2 + 2x]$$

$$\boxed{g(x) = 2x^2 + 4x}$$

The equation of the new graph $g(x) = 2x^2 + 4x$

⑥

⑥ The graph of $f(x) = x^2$ is flipped about the x -axis and then translated by 2 unit to the right and 9 units up. find the equation of the new graph of $g(x)$

sol: we flip a graph about the x -axis, we replace $f(x)$ with $-f(x)$ in the equation

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

To translated by 2 unit to the right, then we need replace x with $(x-2)$ To translate 9 units up, so we need to add 9 to the equation

The equation of the new graph $g(x) = -f(x-2) + 9$

$$\begin{aligned} g(x) &= -f(x-2) + 9 \\ &= -(x-2)^2 + 9 \end{aligned}$$

$$g(x) = -(x-2)^2 + 9 \quad \because \text{apply } (a-b)^2 \text{ formula}$$

$$g(x) = -(x^2 - 4x + 4) + 9$$

$$g(x) = -x^2 + 4x - 4 + 9$$

$$g(x) = -x^2 + 4x + 5$$

The equation of the new graph $g(x) =$
 $-x^2 + 4x + 5$