

4

# Graph Transformation :-

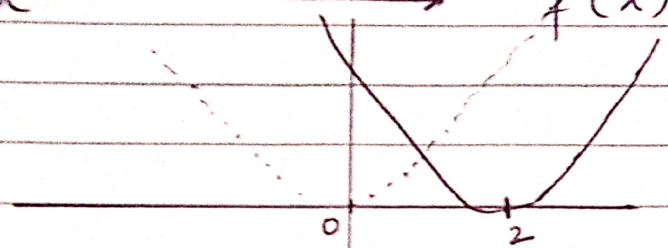
**T-1**

$$y = f(x) \longrightarrow y = f(x-a)$$

→ Shift the actual graph towards right by 'a' units.

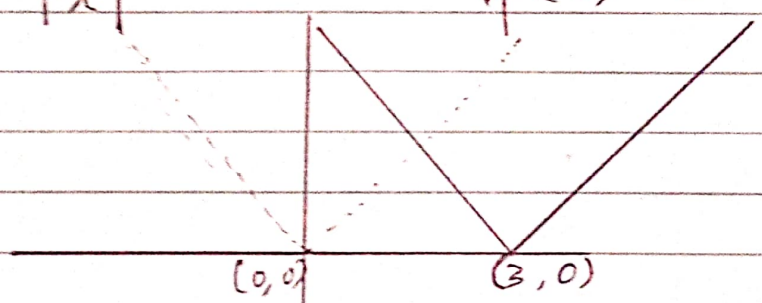
for Example :-  $y = \frac{1}{x} \longrightarrow y = \frac{1}{x-3}$

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



$$\longrightarrow y = e^x \longrightarrow y = e^{x-2}$$

$$\longrightarrow f(x) = |x| \longrightarrow f(x) = |x-3|$$



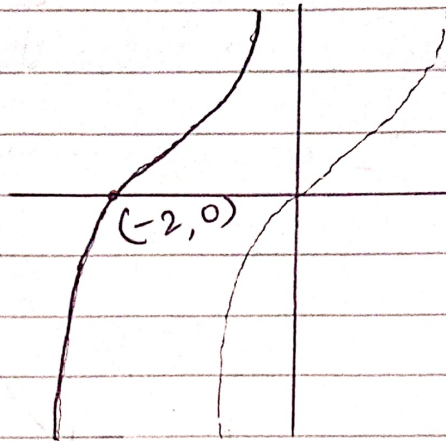
**T-2**

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

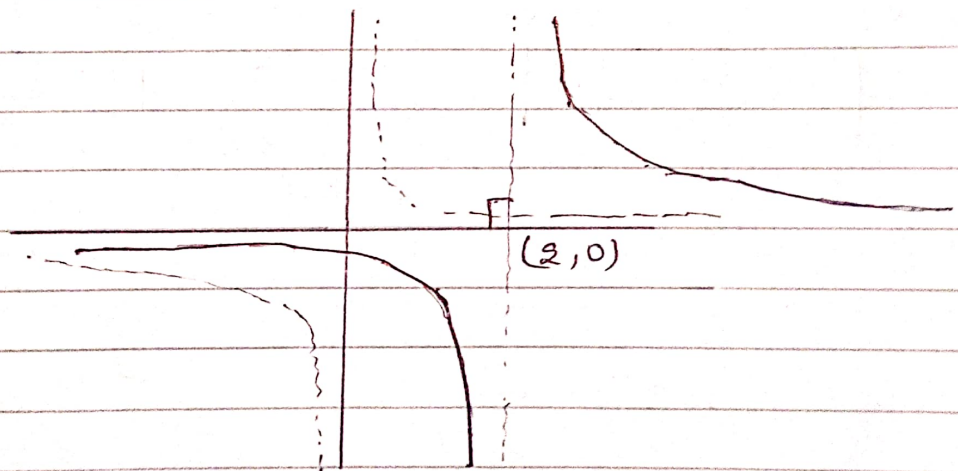
→ Shift the actual graph towards left by 'a' units.

for Example :-

$$\begin{aligned} \rightarrow y = \log_e x &\longrightarrow y = \log_e(x+2) \\ \rightarrow f(x) = (x)^3 &\longrightarrow f(x) = (x+2)^3 \end{aligned}$$

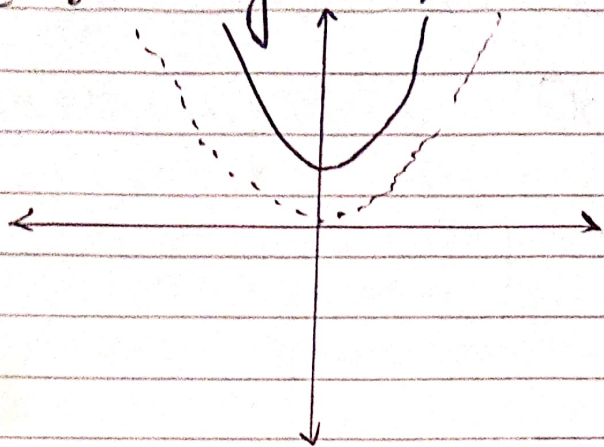


$$\rightarrow f(x) = \frac{1}{x-2}$$

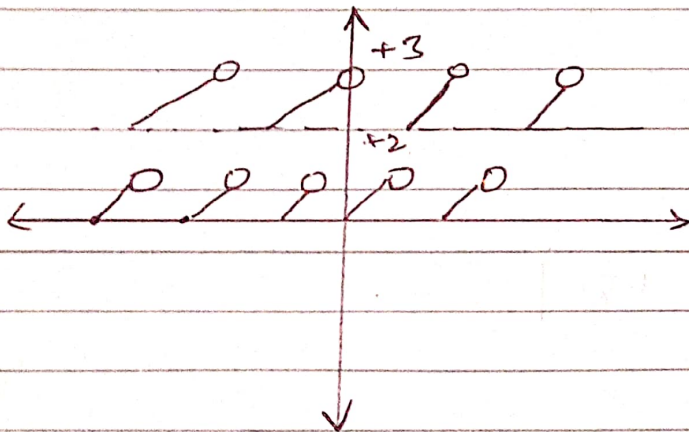


**T-3** :-  $y = f(x) \longrightarrow y = f(x) + a$   
 $\rightarrow$  graph shifts upwards by 'a' units.

For Example :-  $y = x^2 \rightarrow y = x^2 + 2$

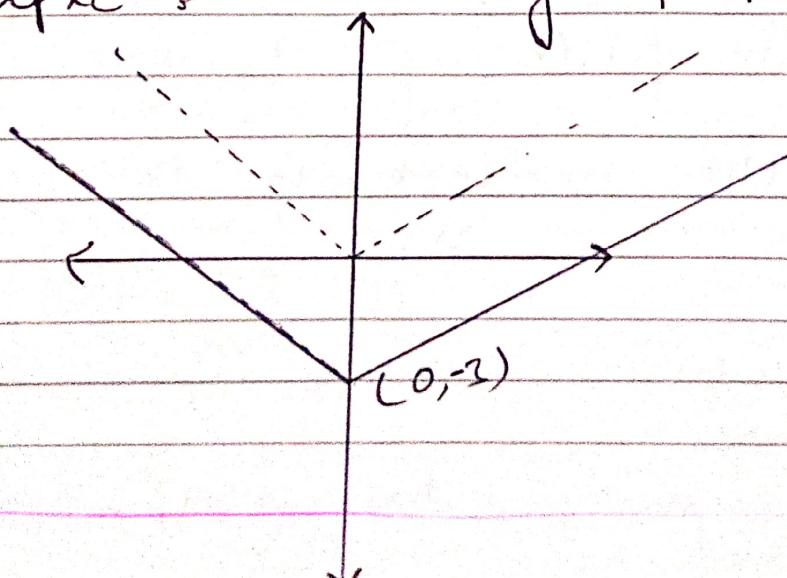


$\rightarrow f(x) = \{x\}$   $\rightarrow f(x) = \{x\} + 2$



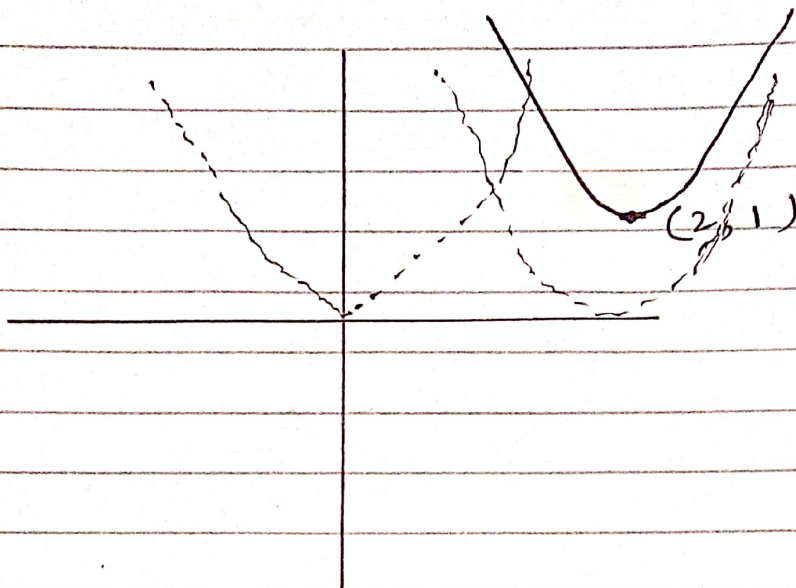
**T-4** :-  $y = f(x) \rightarrow y = f(x) - a$   
 $\rightarrow$  graph shifts downwards by  $a$  units.

For Example :-  $y = |x| \rightarrow y = |x| - 3$

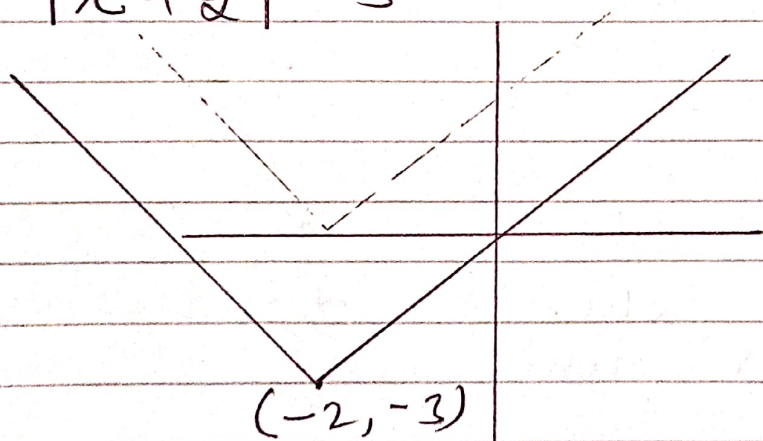


Q. Plot the following functions :-

(A)  $y = (x)^2 \rightarrow y = (x-2)^2 \rightarrow y = \frac{(x-2)^2}{+1}$



(B)  $y = |x+2| - 3$



T-5

$y = f(x) \rightarrow y = |f(x)|$

On variables as well as constants

→ Take the reflection of the graph below  $x$ -axis.

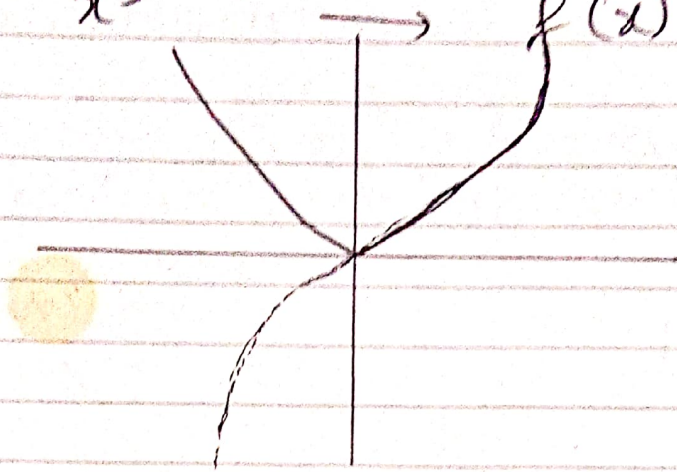
→ Also retain the graph above  $x$ -axis.

→ Then, remove the graph below  $x$ -axis.

For Example :-

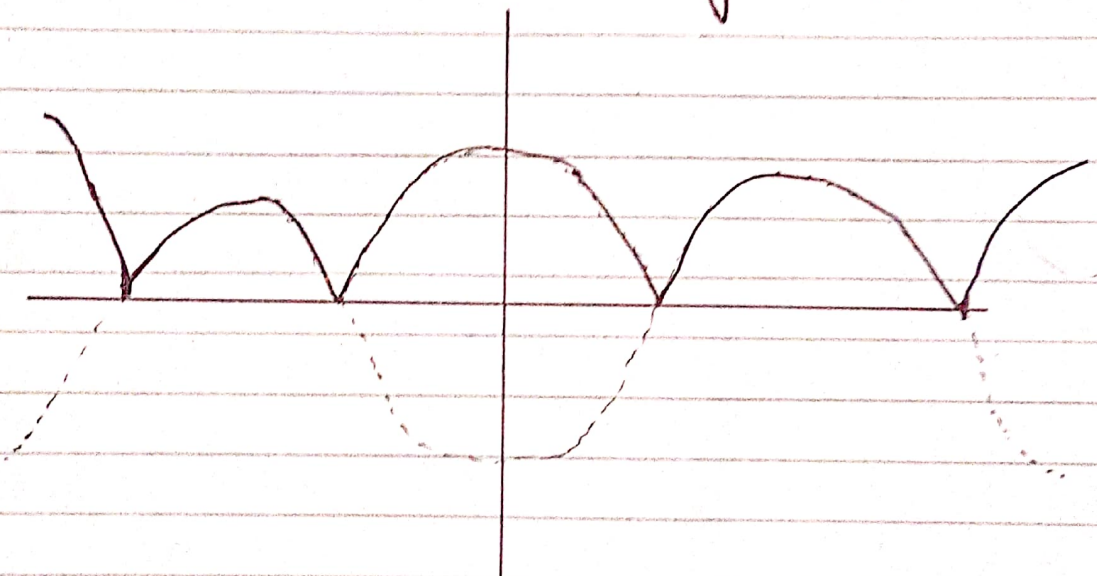
$$\rightarrow f(x) = x^3$$

$$\rightarrow f(x) = |x^3|$$



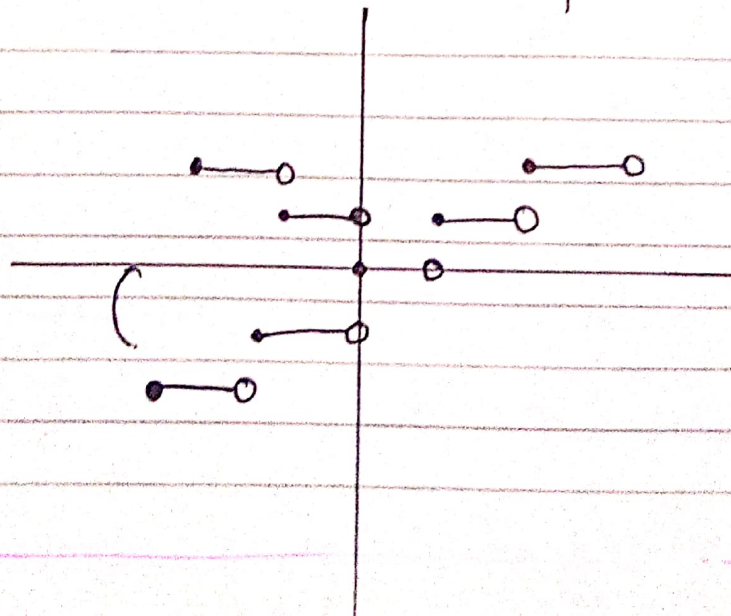
$$\rightarrow f(x) = \sin x$$

$$\rightarrow y = |\sin x|$$



$$\rightarrow f(x) = [x]$$

$$\rightarrow f(x) = |[x]|$$



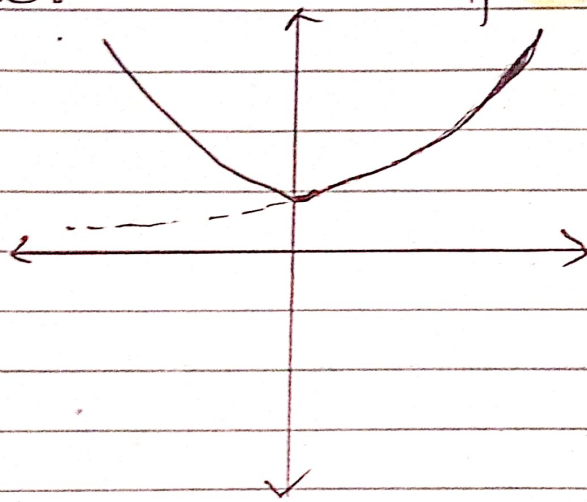
**T-6** :-  $f(x) \rightarrow f(|x|)$  At variable, not on constants.

→ Remove the graph's part present in 2<sup>nd</sup>, 3<sup>rd</sup> quadrant.

→ Take the reflect<sup>n</sup> of remaining graph about y-axis.

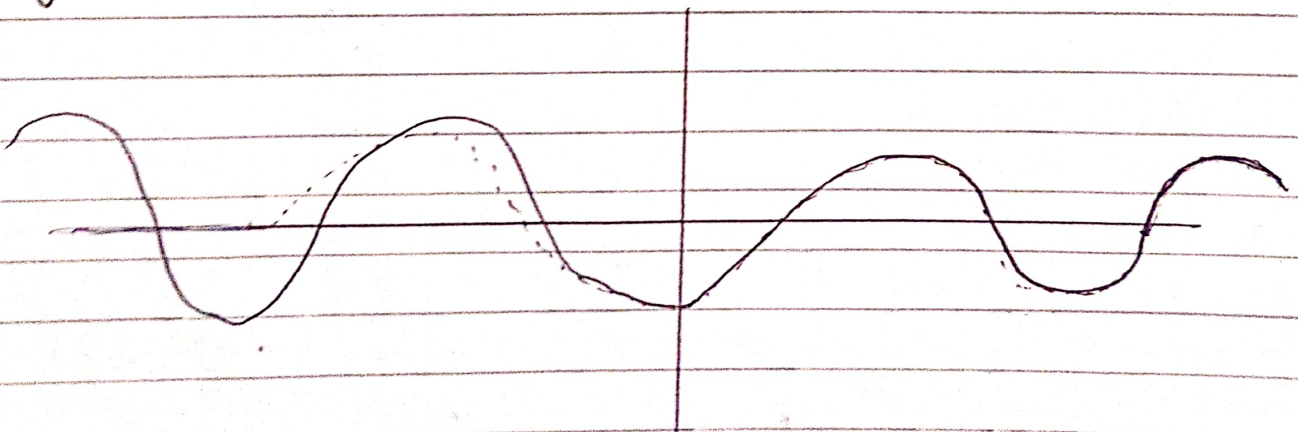
For Example :-

$$f(x) = e^x \rightarrow f(x) = e^{|x|}$$

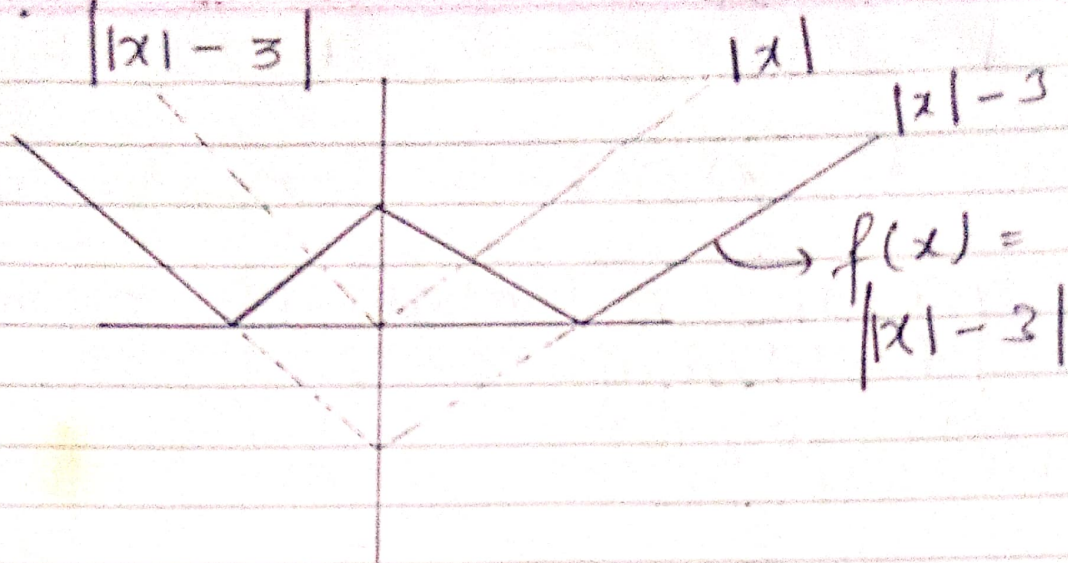


$$\rightarrow y = e^{-x}$$

$$\rightarrow y = e^{-|x|}$$



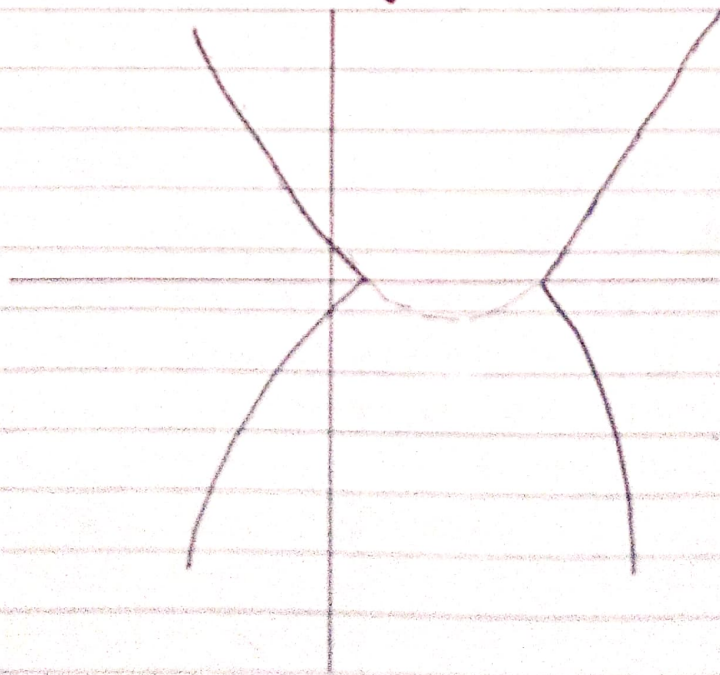
$$\rightarrow f(x) = |x| - 3$$



T-7 :-  $y = f(x) \longrightarrow |y| = f(x)$   
 ↳ +ve output

$y = f(x)$   
 ↳ Remove the whole graph below x-axis.  
 ↳ Draw the "reflect" of the remaining graph.

for Example :-  $|y| = x^2 - 5x + 6$



**T-8** :-  $f(x) \Rightarrow a(f(x))$

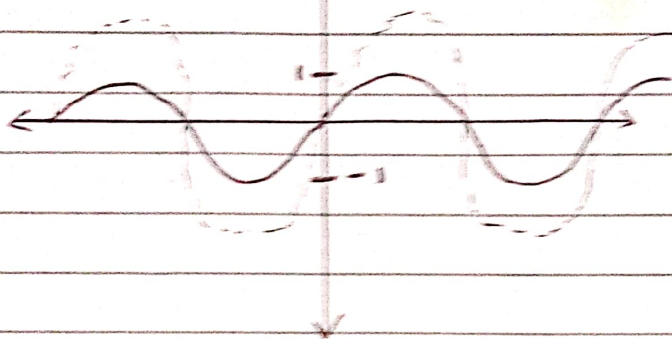
(Case - I)  $a > 1$

Graph inflated by 'a' units

For Example :-

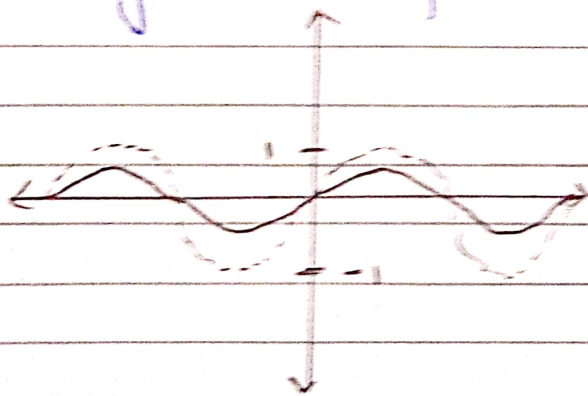
$f(x) \Rightarrow 2f(x)$

where  $f(x) = \sin x$



(Case - II)  $0 < a < 1$

Graph gets deflated by 'a' units.

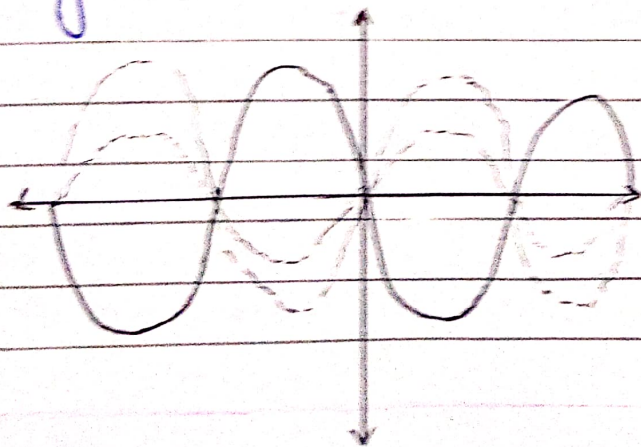


$f(x) = \frac{1}{2}\sin x$

(Case - III)  $- \infty < a$

Graph gets inverted about x-axis.

$f(x) = -2 \sin x$



T-9

Case-I

For

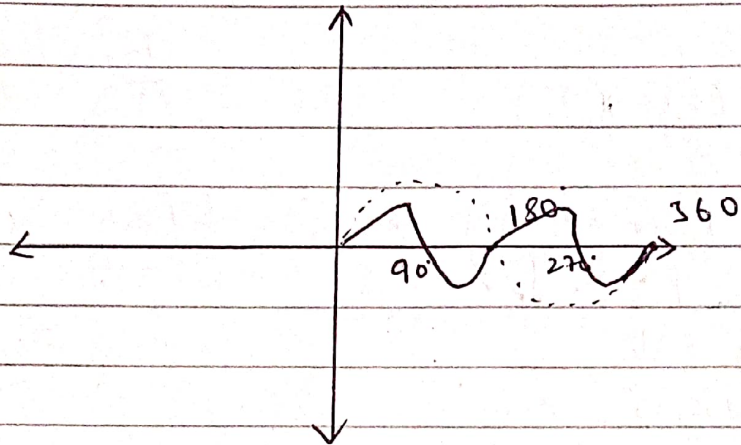
$$f(x) \rightarrow f(ax)$$

$$a > 1$$

Example :-

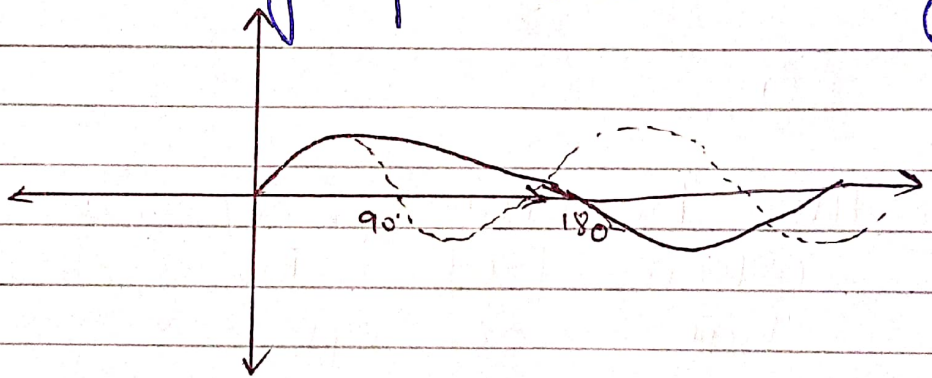
by 'a' graph compresses

$$f(x) = \sin 2x$$



Case-II)  $0 < a < 1$

graph stretches by a



Case-III)  $-1 < a$

Inversion about y-axis

$$\rightarrow \sin(-x)$$

