

## Functions.

Q)  $f(x) = 2x+5$ . Find  $f(2)$ .

$$\therefore f(2) = 2(2)+5 = 9$$

Q)  $f(x) = x+1$  find  $f(5x)$

$$\therefore f(5x) = 5x + 1$$

Q)  $f(x) = x-1$  find  $f(f(x))$

$$\therefore f(f(x)) = (x-1)-1 = x-2.$$

Q)  $f(x) = x^2 - 1$ . Find  $f(f(1))$

$$\therefore f(1) = 1^2 - 1 = 0.$$

$$\therefore f(f(1)) = 0^2 - 1 = -1.$$

Q)  $f(x) \begin{cases} x^2, & x < 0 \\ 1-x, & 0 \leq x \leq 1 \\ 5, & x > 1 \end{cases}$  find.

(i)  $f(-1) = (-1)^2 = 1$

(ii)  $f(1) = 1-1 = 0$

(iii)  $f(13) = 5$ .

## Logarithm

Q. If  $y = x^2 + 1$  find  $x$ .

$$\therefore y = x^2 + 1$$

$$\therefore x^2 = y - 1$$

$$\therefore x = \sqrt{y - 1}$$

Q. If  $y = 2x - 1$  find  $x$ .

$$\therefore y = 2x - 1$$

$$\therefore 2x = y + 1$$

$$\therefore x = \frac{y + 1}{2}$$

$$\rightarrow \pi = 3.14 \dots$$

$$\rightarrow e = 2.718 \dots$$

$$\rightarrow \log_{10} x = \log x$$

$$\rightarrow \log_e x = \ln x.$$



$$(i) \log_b(xy) = \log_b x + \log_b y$$

$$(ii) \log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y.$$

$$(iii) \log_b x^n = n \log_b x.$$

$$(iv) \log_b x = \frac{\log_2 x}{\log_2 b} = \frac{\ln x}{\ln b}$$

$$(v) \log_{10} x = \frac{\log x}{\log 10} = 1.$$

Q. If  $y = 2^x$  then  $x$  is equal to.

$$\text{Ans. } \log_2 y = \log_2 2^x$$

$$\therefore \log_2 y = x \log_2 2$$

$$\therefore \log_2 y = x.$$

$$\therefore x = \log_2 y.$$

$$(i) y = 10^x \text{ find } x.$$

$$\text{Ans. } \log_{10} y = \log_{10} 10^x$$

$$\therefore \log_{10} y = x \log_{10} 10$$

$$\therefore x = \log y.$$



Q)  $y = e^x$  find  $x$ .

Ans.  $\log_e y = \log e^x$

$$\therefore x = \log_e y.$$

~~Below~~  
X  
Q)

$2y = 2^x$  find  $x$ .

Ans.  ~~$\log_2 2y = \log_2 2^x$~~   
 $\therefore x = y.$

Q)  $f(x) = x^2 + 1$ , find  $f(1) = ?$

Ans.  $f(1) = (1)^2 + 1 = 2.$

Q)  $f(x) = \begin{cases} x^2, & x > 0 \\ 2x-1, & x \leq 0 \end{cases}$  find

(i)  $f(0) = 2(0) - 1 = -1.$

(ii)  $f(-2) = 2(-2) - 1 = -5.$

Above  
Ths.  $\therefore 2y = 2^x$

$$\therefore \log_2(2y) = \log_2 2^x$$

$$\therefore x = \log_2(2y) = \log_2 2 + \log_2 y$$

$$\therefore x = 1 + \log_2 y.$$

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## Modulus

#  $| -3 | = 3$   
 $| 3 | = 3$

Q1)  $|x| = 3, x = ?$

Ans.  $x = \pm 3$ .

Q2)  $|x - 1| = 2, x = ?$

Ans.  $x - 1 = 2$

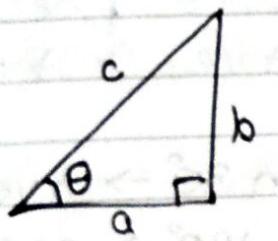
$\therefore x = 3$

and

$x - 1 = -2$

$\therefore x = -1$

## Trigonometry.



$$\therefore \sin \theta = \frac{b}{c}$$

$$\therefore \cos \theta = \frac{a}{c}$$

$$\therefore \tan \theta = \frac{b}{a}$$

$$\therefore \frac{1}{\sin \theta} = \operatorname{cosec} \theta = \frac{c}{b}$$

$$\therefore \frac{1}{\cos \theta} = \sec \theta = \frac{c}{a}$$

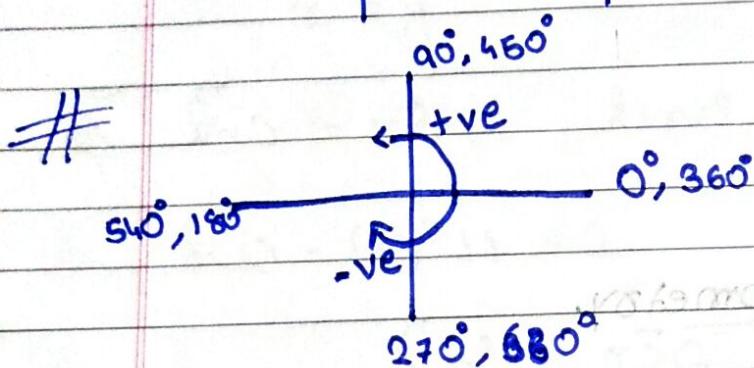
$$\therefore \frac{1}{\tan \theta} = \cot \theta = \frac{a}{b}$$

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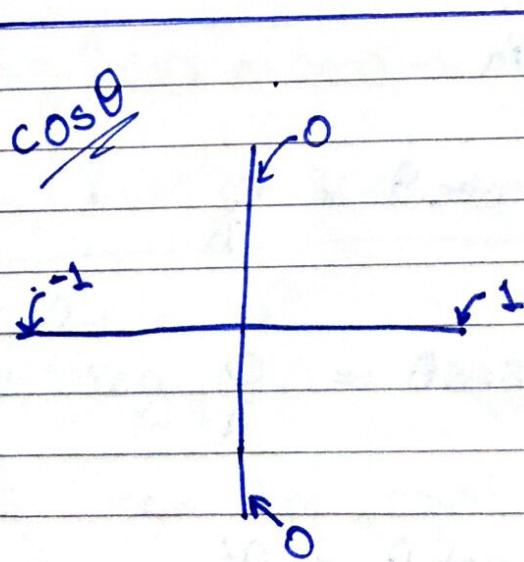
$$\therefore \tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\therefore \cot \theta = \frac{\cos \theta}{\sin \theta}$$

$\theta$	$0^\circ$	$30^\circ$	$45^\circ$	$60^\circ$	$90^\circ$
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan \theta$	0	$\sqrt{3}$	1	$\sqrt{3}$	-

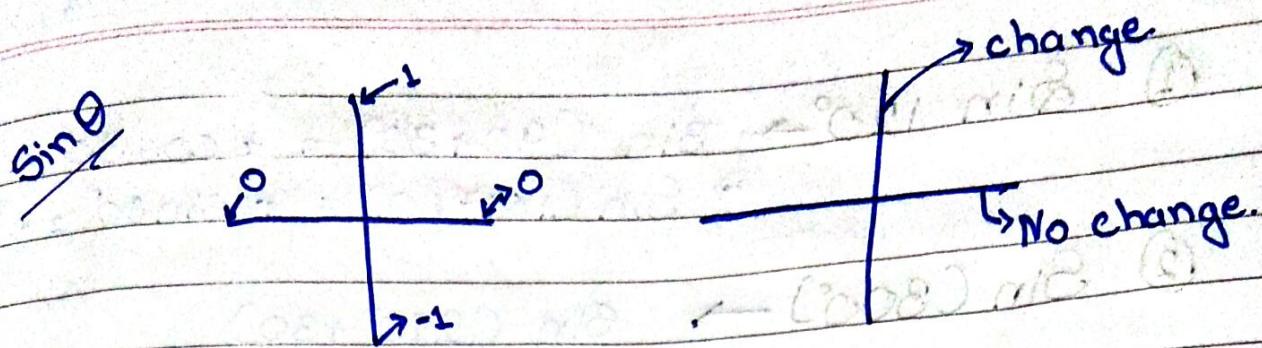


	$\sin \theta$	$\cosec \theta$
+ve	+ve	All +ve
$\tan \theta$		$\cos \theta$
$\cot \theta$		$\sec \theta$
+ve		+ve.



- $\rightarrow \sin 30^\circ \rightarrow +ve$
- $\rightarrow \cos 120^\circ \rightarrow -ve$
- $\rightarrow \tan 180^\circ \rightarrow +ve$
- $\rightarrow \sin (-90^\circ) \rightarrow -ve$
- $\rightarrow \cos (-30^\circ) \rightarrow +ve$
- $\rightarrow \sin (-60^\circ) \rightarrow -ve$
- $\rightarrow \sin (922^\circ) \rightarrow -ve$

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Section-A : Functions

Q1)  $f(x) = \cos x + \sin x$  find  $f(\pi/2)$

Ans.  $f(\pi/2) = \cos \frac{\pi}{2} + \sin \frac{\pi}{2} = \cos 90^\circ + \sin 90^\circ = 1$

Q2)  $f(x) = 4x + 3$  find  $f(f(2))$

Ans.  $\therefore f(2) = 4(2) + 3 = 11$

$\therefore f(f(2)) = 4(11) + 3 = 47$ .

Q3)  $f(x) = \log x^3$  and  $g(x) = \log x$

Which of the following statement is true?

(a)  $f(x) = g(x)$

(b)  $f(x) = 3g(x)$

(c)  $3f(x) = g(x)$

(d)  $f(x) = (g(x))^3$

Ans. Option B is correct.

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①  $\sin 120^\circ \rightarrow \sin(90 + 30) = +\cos 30^\circ = \frac{\sqrt{3}}{2}$   
 $\sin(180 - 60) = +\sin 60^\circ = \frac{\sqrt{3}}{2}$

②  $\sin(300^\circ) \rightarrow$

$\sin(270^\circ + 30)$   
=  $-\cos 30^\circ$   
=  $-\frac{\sqrt{3}}{2}$

$\sin(360^\circ - 60)$   
=  $-\sin 60^\circ$   
=  $-\frac{\sqrt{3}}{2}$

③  $\sin(900^\circ) = 0$

④  $\cos(765^\circ) \rightarrow \cos(720 + 45^\circ)$   
=  $+\cos 45^\circ$   
=  $\frac{1}{\sqrt{2}}$

⑤  $\cos(-30^\circ) \rightarrow \cos(0 - 30)$

=  $+\cos 30^\circ$   
=  $\frac{\sqrt{3}}{2}$

$\rightarrow \cos(-90 + 60)$   
=  $+\sin 60^\circ$   
=  $\frac{\sqrt{3}}{2}$

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⑥  $\sin(-210^\circ) \rightarrow \begin{cases} \sin(-180^\circ - 30^\circ) \\ = +\sin 30^\circ \\ \therefore = \frac{1}{2}. \end{cases}$

$\rightarrow \sin(-270^\circ + 60^\circ)$   
 $= \cos 60^\circ$   
 $= \frac{1}{2}$

(ii)  $\sin^2 \theta + \cos^2 \theta = 1$  and  $\theta = 30^\circ$ .

$\rightarrow (\sin 30^\circ)^2 + (\cos 30^\circ)^2$

$= \left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2$

$= \frac{1}{4} + \frac{3}{4}$

$= \frac{3+1}{4}$

$= \frac{4}{4}$

$\rightarrow$  Mistakes note to do :-

$\rightarrow (\sin x)(2) \neq \sin 2x$

$\rightarrow \sin 2x \neq 2 \sin x.$

$\rightarrow \frac{\sin 2x}{2} \neq \sin x.$

$\rightarrow \sin x^2 \neq (\sin x)^2$

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$$\rightarrow (\sin x)^2 = \sin^2 x$$

$$\rightarrow \frac{1}{\sin x} \neq (\sin x)^{-1} \neq \sin^{-1} x.$$

$$\rightarrow \frac{1}{\sin x} = \operatorname{cosec} x.$$

→ Important formula:-

$$\rightarrow \sin(A+B) = \sin A \cdot \cos B + \cos A \sin B$$

$$\rightarrow \cos(A+B) = \cos A \cos B - \sin A \sin B.$$

$$\rightarrow \sin C + \sin D = 2 \sin \left( \frac{C+D}{2} \right) \cos \left( \frac{C-D}{2} \right)$$

$$\rightarrow \cos C + \cos D = 2 \cos \left( \frac{C+D}{2} \right) \cos \left( \frac{C-D}{2} \right)$$

$$\rightarrow \cos C - \cos D = 2 \sin \left( \frac{C+D}{2} \right) \sin \left( \frac{D-C}{2} \right)$$

→ Trigonometric Identities.

$$(1) \cos^2 \theta + \sin^2 \theta = 1.$$

$$(2) 1 + \tan^2 \theta = \sec^2 \theta$$

$$(3) 1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$$

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$$\rightarrow \sin C + \sin D = 2 \frac{\sin(C+D)}{2} \cdot \frac{\cos(C-D)}{2}$$

$$\rightarrow \sin C - \sin D = 2 \frac{\cos(C+D)}{2} \cdot \frac{\sin(C-D)}{2}$$

$$\rightarrow \cos C + \cos D = 2 \frac{\cos(C+D)}{2} \cdot \frac{\cos(C-D)}{2}$$

$$\rightarrow \cos C - \cos D = 2 \frac{\sin(C+D)}{2} \cdot \frac{\sin(C-D)}{2}$$

$$\rightarrow 2 \sin A \cos B = \sin(A+B) + \sin(A-B)$$

$$\rightarrow 2 \cos A \sin B = \sin(A+B) - \sin(A-B)$$

$$\rightarrow 2 \sin A \sin B = \cos(A-B) - \cos(A+B)$$

$$\rightarrow \sin 2A = 2 \sin A \cos A = \frac{2 \tan A}{1 - \tan^2 A}$$

$$\rightarrow \cot 2A = \frac{\cot^2 A - 1}{\cot A}$$

$$\rightarrow \sin A = 2 \sin \frac{A}{2} \cos \frac{A}{2}$$

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\* Solve the following:-

1)  $\sin 300^\circ$

Ans.  $\sin(270 + 30)$   
=  $-\cos 30^\circ$   
=  $-\frac{\sqrt{3}}{2}$

2)  $\sin 300^\circ$

Ans.  $\sin(360^\circ - 60^\circ)$   
=  $-\sin 60^\circ$   
=  $-\frac{\sqrt{3}}{2}$ .

3)  $\sin(210^\circ)$

Ans.  $\sin(270^\circ - 60^\circ)$   
=  $-\cos 60^\circ$   
=  $-\frac{1}{2}$ .

4)  $\cos(225^\circ)$

Ans.  $\cos(270^\circ - 45^\circ)$   
=  $-\sin 45^\circ$   
=  $-\frac{1}{\sqrt{2}}$ .

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Q5)  $\cos(-45^\circ)$

Ans.  $\cos(-90 + 45^\circ)$   
=  $+\sin 45^\circ$   
=  $\frac{1}{\sqrt{2}}$ .

Q6)  $\sin(-90^\circ)$

Ans.  $\sin(-180 + 90^\circ)$   
=  $-\sin 90^\circ$   
=  $-1$ .

Q7)  $\sin(720^\circ)$

Ans.  $\sin(720 + 60^\circ)$   
=  $+\sin 60^\circ$   
=  $\frac{\sqrt{3}}{2}$

Q8)  $\cos(900^\circ)$

Ans.  $\cos(810^\circ + 90^\circ)$   
=  $\cos 90^\circ$   
= 0.

Q9)  $\tan(-45^\circ)$

Ans.  $\tan(-90^\circ + 45^\circ)$   
=  $-\cot 45^\circ$   
= -1.

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Q-10)  $\sin(-780^\circ)$

Ans  $\sin(-810 + 30^\circ)$   
=  $-\cos 30^\circ$   
=  $-\frac{\sqrt{3}}{2}$

Q-11)  $\cos(-210^\circ)$

Ans  $\cos(-270 + 60^\circ)$   
=  $-\sin 60^\circ$   
=  $-\frac{\sqrt{3}}{2}$ .

Q-12)  $\tan(-300^\circ)$

Ans  $\tan(-360 + 60^\circ)$   
=  $+\tan 60^\circ$   
=  $\sqrt{3}$ .

Q-13)  $\sin(-945^\circ)$

Ans  $\sin(-900 - 45^\circ)$   
=  $+\sin 45^\circ$   
=  $\frac{1}{\sqrt{2}}$ .

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(Q-14)  $\tan(210^\circ)$

$$\begin{aligned} \text{Ans. } \tan(270 - 60^\circ) \\ = -\cot 60^\circ \\ = -\frac{1}{\sqrt{3}} \end{aligned}$$

(Q-15)  $\sin(930^\circ)$

$$\begin{aligned} \text{Ans. } \sin(900 + 30^\circ) \\ = -\sin 30^\circ \\ = -\frac{1}{2}. \end{aligned}$$