GRAPHS OF SOME FUNCTIONS AND THEIR BEHAVIOUR

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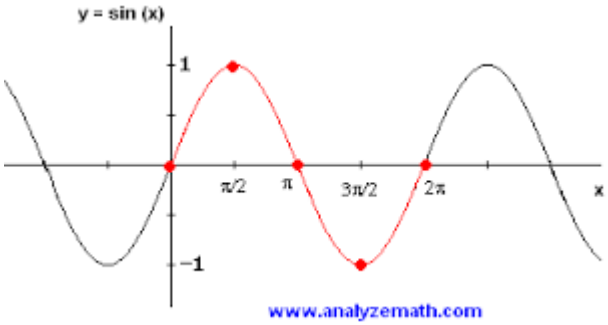
If anyone has a problem to understand, feel free to ask me any question. My Mail id is saikatsarkar098gmail.com.

$Q.1.$ *Draw the graph of the following functions*:

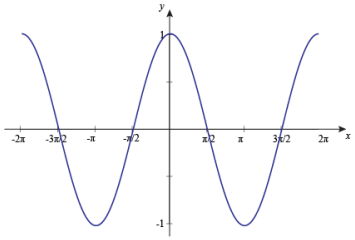
$(i) f(x) = \sin x$, $(ii) f(x) = \cos x$, $(iii) f(x) = \tan x$, $(iv) f(x) = |\sin x|$, (v) $f(x) = ax + b$, *where a and b are any arbitrary value of a real number*, $(vi) f(x) = |x + a|$, *where a is any arbitrary value of a positive real number*, $(vii) f(x) = |x + y| \leq 1$, *where x and y is any real number*, $(viii) f(x) = min\{|x|, |x - 1|\}$, $(ix) f(x) = ce^x$, *where c is any arbitrary value ofpositive real number* , (x) $f(x) = e^{-x}$, $(xi) f(x) = [x]$, $(xii) f(x) = logx$, $(xiii)(x - a)^2 + (y - b)^2 = r^2$, $(xiv) f(x) = x - [x]$, *where* $[x]$ *denotes the greatest integer which is less than or equal to* x; $(xv) f(x) = \begin{cases} x & , if\ x \geq 0 \\ 0 & , if\ x < 0 \end{cases}$.

Solution: *I have prepared this paper for undergraduate student. so first of all i have to describe the main characteristics of these graphs.*

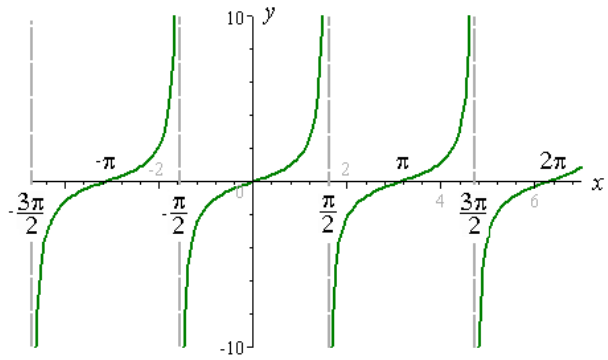
$(i) f(x) = \sin x$; *it is a periodic function, and the period is* 2π. *it is also a continuous and a odd function. so, the graph of this function is* ,



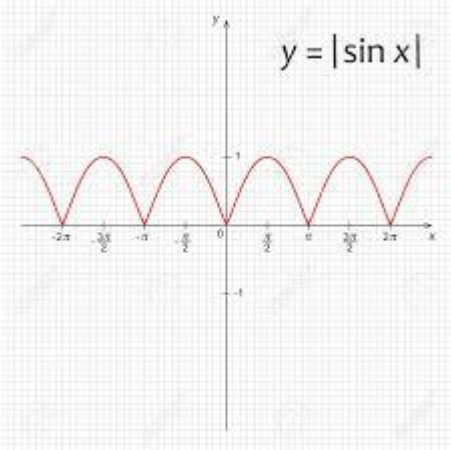
$(ii) f(x) = \cos x$; *it is also a periodic function with period* 2π *and it is also a continuous function. so, the graph of this function is,*



$(iii) f(x) = \tan x$; *it is a periodic function with period* 2π. *it has vertical asymptote. line* $x = \frac{\pi}{2} + k\pi, k \in \mathrm{Z}$. *so, the graph of this function is,*

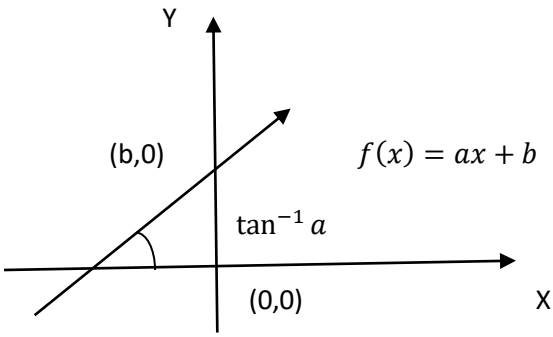


$(iv) f(x) = |\sin x|$; *it is a period funtion with period* π. *it is just like aconcave function to origin. so, the graph is,*



in this graph x axis is representing as a mirror. and it is a mirror image of $\sin x$.

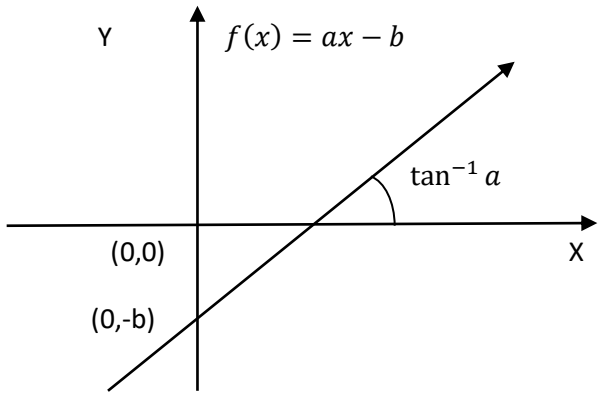
$(v) f(x) = ax + b$; *where a and b is any aritrary real number. it is a linear function and b is its intercept on y axis . at* $x = 0$ $f(x)$*can take b only. so, the co ordinate is* $(0, b)$. *b may be positive or negative. here a is its slope i. e.* $a = \tan\theta$ *. so , the graph is ,*



$f(x) = ax + b$

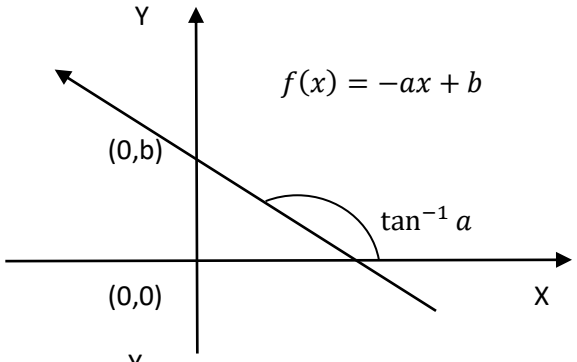
, *where* $b > 0, 0 < \tan^{-1} a < \frac{\pi}{2}$.

(i)



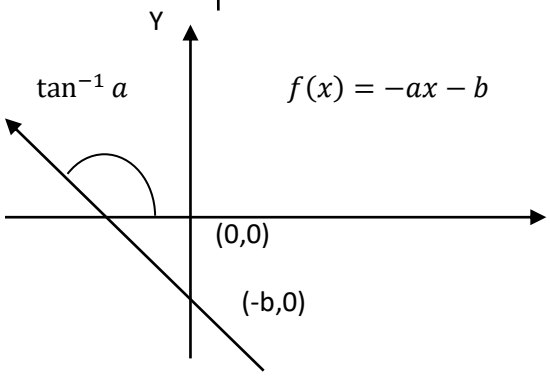
$,where\ b > 0, 0 < \tan^{-1} a < \frac{\pi}{2}.$

(ii)



$,where\ b > 0, \frac{\pi}{2} < \tan^{-1} a < \pi.$

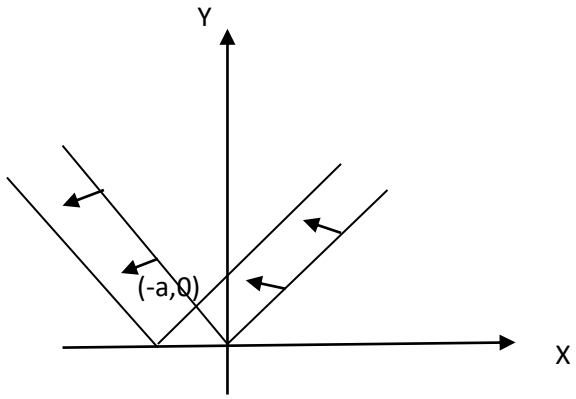
(iii)



$,where\ b > 0, \frac{\pi}{2} < \tan^{-1} a < \pi.$

(iv)

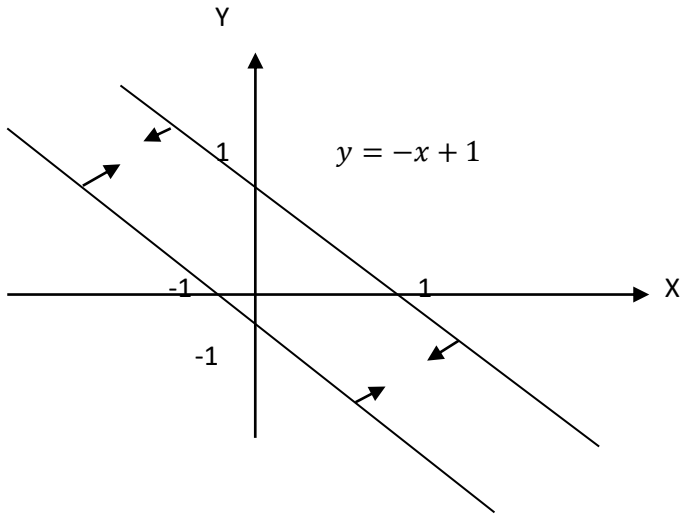
$(vi) f(x) = |x + a|; where\ a\ is\ any\ arbitrary\ \ positivereal\ number. this\ function\ is\ a\ mirror\ image(in\ the\ x\ axis\ )\ of\ the\ function\ x + a. this\ grph\ has\ a\ corner. corner\ point\ of\ the\ graph\ called\ vertex, occurs\ at\ the\ x = -a. f(x) = |x + a|\ is\ symmetric\ in\ y\ axis. it\ is\ differentiable\ for\ every\ x \neq -a. and\ not\ differentiable\ at\ x = -a. so, the\ graph\ is\ ,$



$,where\ a > 0$

$(vii)|x + y| \leq 1; where\ x\ and\ y\ is\ any\ real\ number,$

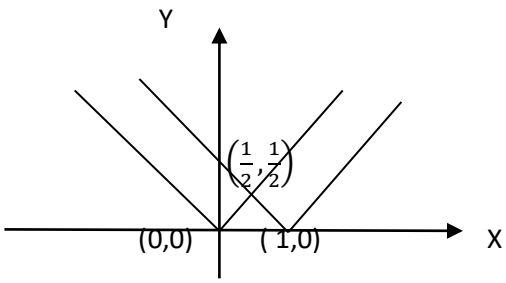
$we\ know\ \ |x + y| \leq 1 \Rightarrow -1 \leq x + y \leq 1 \Rightarrow -1 - x \leq y \leq 1 - x.\ so, the\ region\ is$

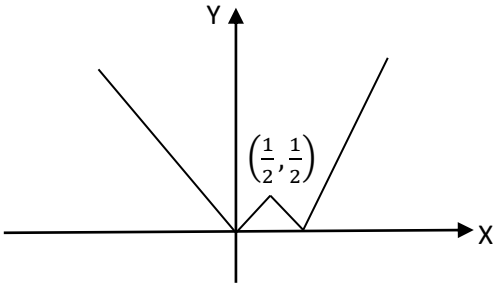


$y = -x - 1$

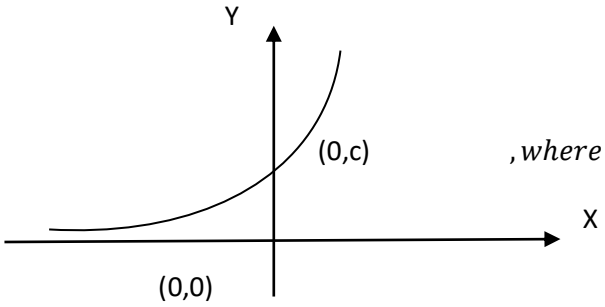
$(viii) f(x) = min\{|x|, |x - 1|\}, first\ of\ all\ i\ have\ to\ draw\ the\ graph\ of\ the\ two\ functions\ then$

$take\ the\ min.$



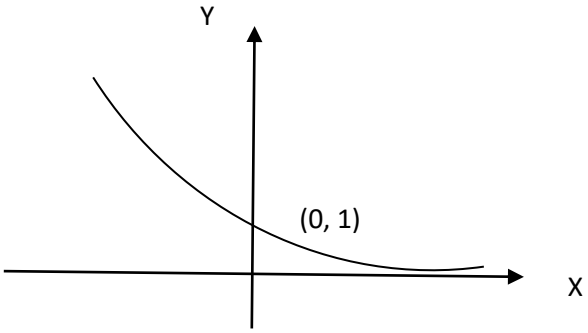


$(ix) f(x) = ce^x; where\ c\ is\ any\ positive\ real\ number. At\ x = 0\ the\ graph\ takes\ c. the\ graph\ is\ ,$



$, where\ c > 0.$

$(x) f(x) = e^{-x}; At\ x = 0\ it\ takes\ 1. so\ the\ graph\ is,$

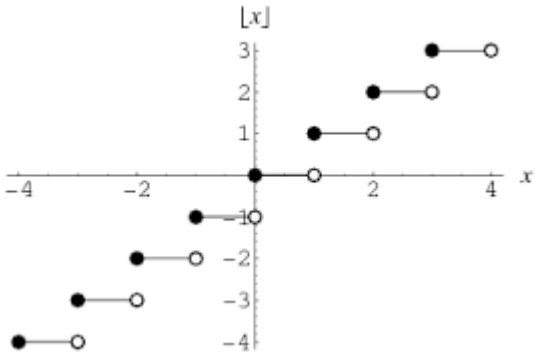


$(xi) f(x) = [x];\ \forall\ x \in \mathbb{R}. it\ indicates\ the\ integral\ part\ of\ x\ . it\ is\ also\ called\ as\ floor\ of\ x.$

$for\ instance\ , [2.3] = 2, [4.23] = 4. her\ f(x)\ could\ be\ expressed\ graphically\ as;$

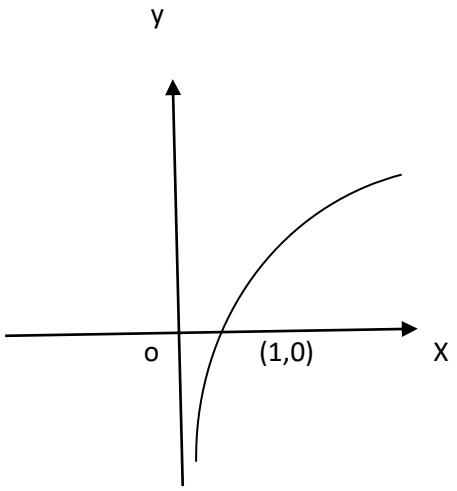
x	$[x]$
$0 \leq x < 1$	0
$1 \leq x < 2$	1
$2 \leq x < 3$	2
$\vdots$	$\vdots$

$so, the\ graph\ is,$

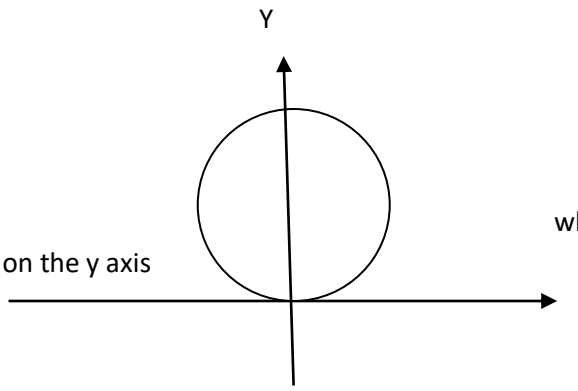


$(xii) f(x) = logx; in\ mathematics, logarithm\ is\ the\ inverse\ function\ to\ exponentiation. so, the\ inverse\ of\ the\ exponential\ function\ is\ denoted\ by\ \log_a x\ \ write$

$y = a^x; a > 0 \Rightarrow x = \log_a y; where\ x \in \mathbb{R}\ and\ y \in (0, \infty). so\ the\ graph\ is,$

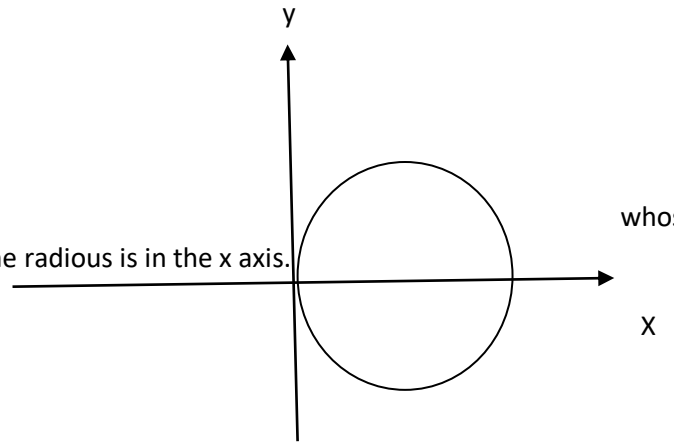


$(xiii)\ (x-a)^2 + (y-b)^2 = r^2; this\ is\ a\ equation\ of\ a\ circle\ whose\ centre\ is\ (a,b), where\ a\ and\ b\ is\ non\ negative\ \ real\ number, and\ r\ is\ radious\ of\ the\ circle. so\ the\ graph\ is,$



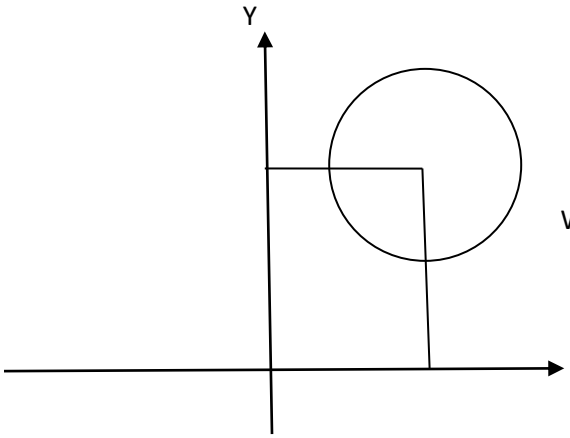
the centre is on the y axis

whose centre is (0,b) and radious is b, and



a. and the the radious is in the x axis.

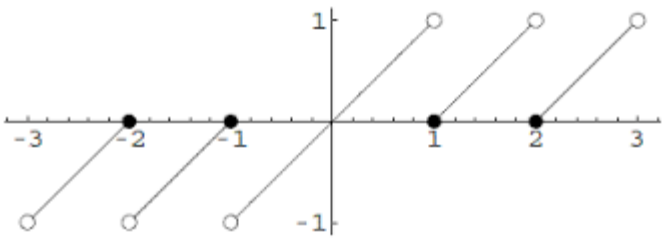
whose centre is (a,0) and the radious is



Whose centre is (a,b) and the radious is r

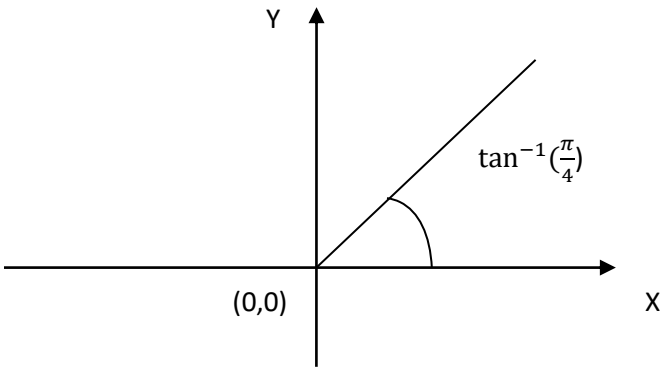
$(xiv) f(x) = x - [x]; x\ is\ any\ real\ number. it\ is\ a\ fractional\ part\ of\ x. Thus, in\ y = \{x\}.$

$x = [x] + \{x\}; where\ [x]\ integer\ part\ of\ x\ and\ \{x\}\ fractional\ part\ of\ x. so\ the\ graph\ is,$



$f(x) = frac(x)$

$(xv) f(x) = \begin{cases} x\ , if\ x \geq 0 \\ 0\ , if\ x < 0 \end{cases}$ $. so, the\ graph\ is,$



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2. WIKIPEDIA.