FORMULAE SHEET

Table: Domain and range of some standard functions-

Functions	Domain	Range
Polynomial function	R	R
Identity function x	R	R
Constant function K	R	(K)
Reciprocal function $\frac{1}{x}$	R_0	R_0
$X^2, \|x\|$ (modulus function)	R	$R^+ \cup \{x\}$
$x^3, x\|x\|$	R	R
Signum function $\frac{\|x\|}{x}$	R	{-1,0,1}
$X+\|x\|$	R	$R^+ \cup \{x\}$
$x-\|x\|$	R	$R^- \cup \{x\}$
[x] (greatest integer function)	R	1
x-{x}	R	[0,1]
$\sqrt{x}$	(0, ∞)	[0,∞]
a^x(exponential function)	R	R^+
Log x(logarithmic function)	R^+	R

Inverse Trigo Functions	Domain	Range
$\sin^{-1}x$	(-1,1]	$\left[\frac{-\pi}{2},\frac{\pi}{2}\right]$
$\cos^{-1}x$	[-1,1]	$[0, \pi]$
$\tan^{-1}x$	R	$\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$
$\cot^{-1}x$	R	$(0, \pi)$
$\sec^{-1}x$	R-(-1,1)	$[0, \pi]-\left\{\frac{\pi}{2}\right\}$
$\text{cosec}^{-1}x$	R-(-1,1)	$\left[\frac{-\pi}{2},\frac{\pi}{2}\right]$-{0}

Inverse function: f^{-1} exists iff f is both one–one and onto.

$f^{-1}:B\rightarrow A$, $f^{-1}(b)=a \Rightarrow f(a)=b$

Even and odd function: A function is said to be

(a) Even function if f(x)=f(x) and

(b) Odd function if f(–x)= –f(x)

Properties of even & odd function:

(a) The graph of an even function is always symmetric about y-axis.

(b) The graph of an odd function is always symmetric about origin.

(c) Product of two even or odd function is an even function.

(d) Sum & difference of two even (odd) function is an even (odd) function.

(e) Product of an even or odd function is an odd function.

(f) Sum of even and odd function is neither even nor odd function.

(g) Zero function, i.e. f(x) = 0, is the only function which is both even and odd.

(h) If f(x) is an odd (even) function, then $f'(x)$ is even (odd) function provided f(x) is differentiable on R.

(i)A given function can be expressed as sum of even and odd function.

i.e. $f(x)=\frac{1}{2}\left[f(x)+f(-x)\right]+\frac{1}{2}\left[f(x)-f(-x)\right]$ =even function + odd function.

Increasing function: A function f(x) is an increasing function in the domain, D if the value of the function does not decrease by increasing the value of x.

Decreasing function: A function f(x) is a decreasing function in the domain, D if the value of function does not increase by increasing the value of x.

Periodic function: Function f(x) will be periodic if a +ve real number T exists such that

$f(x+T)=f(x), \forall x \in$ Domain.

There may be infinitely many such real number T which satisfies the above equality. Such a least +ve number T is called period of f(x).

(i) If a function f(x) has period T, then period of f(xn+a)=T/n and period of (x/n+a)=nT.

(ii) If the period of f(x) is T_1 & g(x) has T_2 then the period of f(x) ± g(x) will be L.C.M. of T_1& T_2 provided it satisfies definition of periodic function.

(iii) If period of f(x) & f(x) are same T, then the period of af(x)+bg(x) will also be T.

Function	Period
sin x, cos x	2π
sec x, cosec x	
tan x, cot x	π
sin (x/3)	6π
tan 4x	$\pi/4$
cos $2\pi x$	1
$\lvert\cos x\rvert$	π
$\sin^4 x+\cos^4 x$	$\pi/2$
$2\cos\left(\frac{x-\pi}{3}\right)$	6π
sin3 x + $\cos^3 x$	$2\pi/3$
$\text{Sin}^3 x + \cos^4 x$	2π
$\frac{\sin x}{\sin 5x}$	2π
$\tan^2 x - \cot^2 x$	π
x-[x]	1
[x]	1