FORMULA SHEET:-

$$[\sin^{-1}(x)]' = \frac{1}{\sqrt{1-x^2}}$$

$$\operatorname{cosec}^{-1}x = \frac{-1}{|x|\sqrt{x^2-1}}$$

$$[\cos^{-1}(x)]' = \frac{-1}{\sqrt{1-x^2}}$$

$$\sec^{-1}x = \frac{1}{|x|\sqrt{x^2-1}}$$

$$[\tan^{-1}(x)]' = \frac{1}{1+x^2}$$

$$\cot^{-1}x = \frac{-1}{1+x^2}$$

$(\sin x)' = \cos x$

$(\operatorname{cosec} x)' \Rightarrow -\operatorname{cosec} x \cot x$

$\tan 90 = \infty$

$(\cos x)' = -\sin x$

$\cot^2 x = \operatorname{cosec}^2 x - 1$

$\cos^2 x = 1 - \sin^2 x$

$(\tan x)' = \sec^2 x$

$(e^x)' = e^x(1)$

Integration by parts:-

x^0 (algebric).

ILATE:-

$$\int f(x).g(x)dx \Rightarrow f(x)\int g(x)dx - \int\left([f(x)]'\int g(x)dx\right)dx$$

LIATE:-

$$uv - \int v\,du$$

Halfangle identities

$$\sin\frac{t}{2} = \sqrt{\frac{1-\cos t}{2}}.$$

$$\sin^2 t = \frac{1-\cos 2t}{2}.$$

$$(\sin 2t)^2 = \frac{1-\cos 2(2t)}{2}.$$

$$\int \frac{1}{x\sqrt{x^2-1}}\,dx \Rightarrow \tan^{-1}(\sqrt{x^2-1}) + C.$$

$$\int \frac{1}{a^2+x^2}\,dx \Rightarrow \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C.$$

$$\lim_{n\to\infty}\left(1+\frac{x}{n}\right)^n = e^x.$$

Chapter no. 14.

Ey

Domain of all
$\left(\frac{P(x)}{q(x)}\right) \Rightarrow \mathbb{R}$ if polynomial without $\sqrt{\ }$

In multivariable functs i.e.

$f(x,y)$: double variable
$f(x,y,z)$: triple variable.

a linear funct is always a plane structure & a non-linear structure is a 3D object / surface.

- Taking multivariable functs;
  Limits.
  - either isolate x (1 variable).

e.g. $z = f(x,y)$

$$\frac{\partial f}{\partial x} / f_x (x,y) = \lim_{h \to 0} \frac{f(x+h,y) - f(x,y)}{h}.$$

- or isolate y (other variable).

$$\frac{\partial f}{\partial x} / f_y (x,y) = \lim_{h \to 0} \frac{f(x, y+h) - f(x,y)}{h}.$$

- Taking partial derivative in multivariable functs.

e.g $f(x,y) = xy^2 + x + y$.

$\frac{\partial f}{\partial x}$ w.r.t x ∴ treat y as a const.

$$= \frac{\partial f}{\partial x}(xy^2) + \frac{\partial f}{\partial x}(x) + \frac{\partial f}{\partial x}(y).$$

$$\Rightarrow y^2(1) + 1 + (y)'(1).$$

$$y^2 + 1 + 0 \Rightarrow y^2 + 1 \text{ Ans!}$$

$\frac{\partial f}{\partial y}$ w.r.t y treat x as const.

$$\Rightarrow \frac{\partial}{\partial y}(xy^2) + \frac{\partial}{\partial y}(x) + \frac{\partial}{\partial y}(y).$$

$$2yx + 1 \text{ Ans!}$$

Chapter no. 4.

4.1

- Extreme Values:-

Let a funct be defined at an interval (a,b)

$y = f(x) \quad (a,b)$

then x_0 any value from the domain/interval will give to be minima or maxima of the funct.

Minima

if $(x_0) \in (a,b)$ &

$f(x_0) \leq f(x)$ ∴

x_0; it is the minima.

Maxima.

if $(x_0) \in (a,b)$ &

$f(x_0) \geq f(x)$ ∴

x_0, is the maxima.

→ minima & maxima are the extreme values of a funct and when described in subdomain called as local & when described in whole domain called as global.

→ Steps:-

(i) Find end points. $f(a)$ & $f(b)$

(ii) Find critical point $f'(x) = 0$.

(iii) Compare all points. $f(a), f(b)$ $f(C.P)$.

* to describe if the minima or maxima is absolute; closed interval (or continuous funct) is needed.

* In modulus functs $f'(x) = 0$ cannot give the critical point rather the critical point is equal to $f(\underline{a})$ and a is the common const found in the interval of both +ve & -ve values of the modulus funct.

* for Q questions if $f'(x) = 0$ cannot be solved. f(critical point = 0.

block of electrons.

2nd * Amorphous Silicon → main semiconductor!

if $\frac{P(x)}{q(x)} \rightarrow f(x)$ given. Polynomial & disc of $q(x)$ is neg.

if the $f'(x)$ is positive and not undefined anywhere.

e^x ($D \in \mathbb{R}$).

$\ln$ ($D \in \mathbb{R}^+$)

$\sin^{-1}$ ($D \in [-1,1]$).

——— x ———

4.3:-

Finding interval at which the funct is increasing or decreasing.

- steps to solve / find increasing or decreasing.

(i) take first derivative of the funct.

(ii) let $f'(x) = 0$ [to usually get two end points].

(iii) make open intervals from [$-\infty$-(critical point)$-+\infty$] to check from each interval.

(iv) let value from each interval $f'(a)$ and if $f'(a) > 0$ ∴ increasing
& $f'(a) < 0$ ∴ decreasing.

E.g:- $f'(x) = \frac{(x-2)(x+4)}{(x+1)(x-3)}$ $D = \mathbb{R} - \{-1, 3\}$

$0 = x^2+4x-2x-8 \Rightarrow x^2+2x-8 \Rightarrow (x-2)(x+4)=0$

$x = 2$ & $x = 4$. however the restrictions of domain apply.

$(-\infty, -4)$ $(-4, -1)$ $(-1, 2)$ $(2, 3)$ ⇒ are the intervals to be checked.

* interval breaking by domain is highly important!

* Critical point a point at which the first derivative $= 0$ or undefined. however critical point can not be an interior part of the domain.

44.

Concavity of Function:-

Concave up

concave down.

(i) sett the intervals from domain & the critical point.

(ii) find the point of inflexion.

(iii) Put the det values from each interval into the the second derivative. (y'')

if $y''(a) > 0$ concave up

if $y''(a) < 0$ concave down.

Point of inflexion. (2nd derivative put equal to 0).

When the second order derivative is equal to zero; It is known as point of inflexion; a point where the concavity is changing and thus cannot be noted.

undefined form 1^{∞}, $\frac{\infty}{\infty}$, $\frac{0}{0}$, 0^0, $\infty - \infty$

* L'Hopital need a fraction to be executed.

$\lim_{x \to 0} \frac{\sin x}{x} = 1.$

* limit can by pass a common limit.

$\ln(0) = \infty$

$\int = \_\_$ (prove?)

simply find derivative of non integral size.

$\log_a b = \frac{\ln b}{\ln a}.$

electrons.

Amorphous Silicon → main semiconductor!