Desmitions: function of two variables:

If a quantity is has a unique, finite value for every pair of values of x and y, them is called a function of two variables x and y. A function of two variables x and y is symbolically written as

f(x, y) or F(x, y) or \(\phi(x, y) \) Domain: Domain of a function of two variables
is a subset of IR2=RxR=((x,y); x,ycr) Range is subset of R.

Thus a function f of two variable is denoted by

f: S -> R where SCR2 Similarly, a function of those variables is denoted as Fis > R where SCR3. Yortial derivatives of first orders Let z=f(x,y) be a function of two independent variables & andy of y is kept constant and & alone is allowed to vary, then z becomes a function of x only. The derivative of z with respect to x, treating y as constant is called partial derivative of z worst x is denoted by Jz ox to x fx.

dz = lim f(x+h,y)-fixy)

dx h->0

Similary soldonor out

dz = lim f(x,y+k)+dixy)

dy K->01000 to R ing de and de alled first order partial derivatives of ? * Composite functions. H z=f(x,y) where x= \$\phi(u,v), y=\ph(u,v)\$

then z is called a composite function of

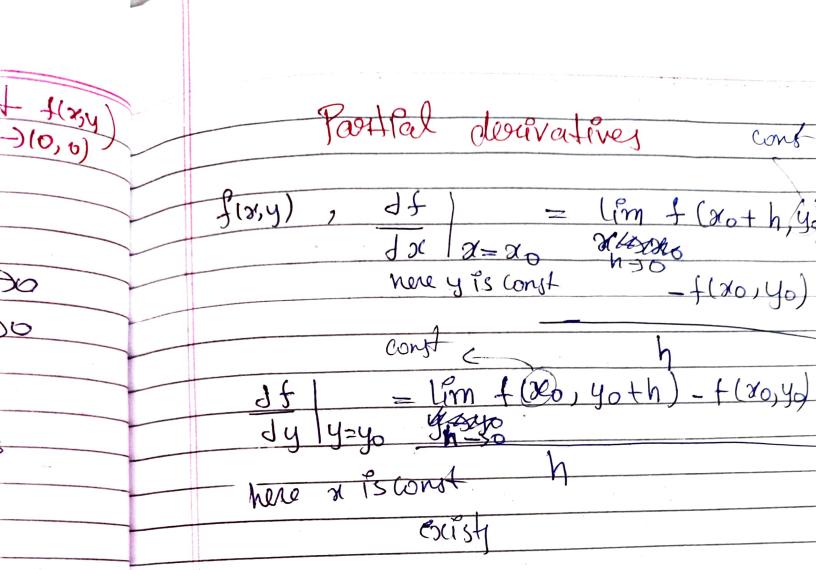
(two variables) u and v so that we can find dz and dz. Diff of composite function:

If u is composite function of I defined by the relations u = f(x,y); $x = \phi(1)$, y = yy(t) then $du = du \cdot dx + du \cdot dy$ dt dx dt dy dtdu is called the total derivative of u It to distinguish it from partial derivating du and dy

limit:

$$(x,y) \rightarrow (a,b)$$
 $(x,y) \rightarrow (a,b)$
 $(x,y) \rightarrow (a,b)$

Continuitys function of two vougable is said to continuous at (a,b) it be 442 flyy) = flasb) (x,4) -> (a,b) must be defined fis discontinou Limit = L



Taylor's theorem Taylor's theorem about Etheca, b) for f(x,y) = f(a,b) + (x-a) + (x-b) + (y-b) + (y+ 1 (x-a)2 fxx(a,b)+2(x-a)(y-b)fx(0) (4-b)2 fyy (a,b) + 1 (x-a)3-G(xx(a,b)+3(x-a)2(y-b)f(a,b) + 14-6)3(x-a)(y-b) fxyy (a,b)+ (y-b)fyy maclauria's theorem for two variable 7

* Jacobians. If u and v are functions of two independent vocables & and y, then the delerminant du du is called Jacobian of u, v with respect to x, y and is denoted by the Symbol J [U,V] or J(U,V) * Bopensies If you are functions of y,s where y, s are functions of xis then $\frac{d(u,v)}{d(u,v)} \times \frac{d(r,s)}{\sqrt{d(u,v)}}$ d(x,4) d(x,5) d(x,y) If I is he Jacoban of u, v with respect to I, y and I go the Jacoban of X, y with respect to U, V then J, Jazl i.e. d(u, y) od(x, y)=1 J(x,y) J(U,v) Jacoblan of Implicit function Jule 143-40) = (-1) 1 d(f, f2 -- fn) 30 J(2/17/2) -- 7/1) J (7/1, 7/2 -- 7/n) Joseph Sn) Jelli, Uz · Un)

Vector Sunctions If to each value of a scalar variable there corresponds a value of a vector \vec{r} then \vec{r} is called a vector function of the scalar variable \vec{r} and we write $\vec{r} = \vec{r}(1)$ or 7)2 (4) Since every vector can be uniquely expressed as a linear combination of three fixed mon-coplanar vectors we may corite 7(+)=f,(+)i+f2(+)j+f3(+)h

i,j,i- uni+ vectors along the axis of x, y, z f,H), f2(+) and f3(1) _ compon of redort) Destivative of a constant vectors

A vector is said to be constant if both its
magnitude and direction one fixed. If either
of these change, the vector is not constant.