

$$= \frac{4}{2t} \left[-(2t)^{2t} + 2k^{2t} + 2k^{2t} \right]$$

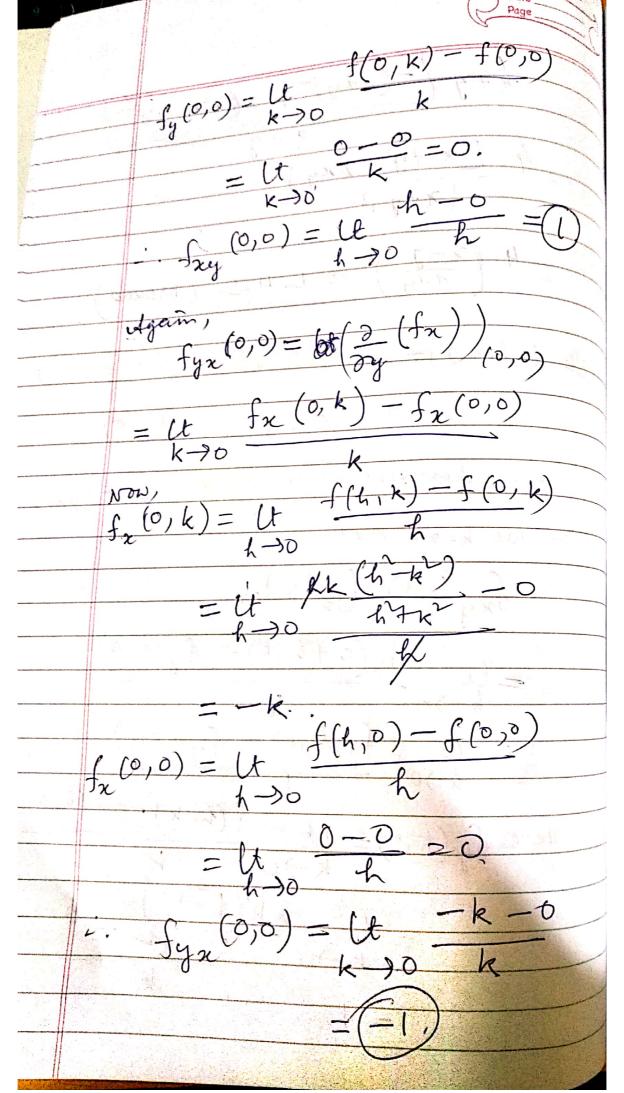
$$= 2t^{2t}$$

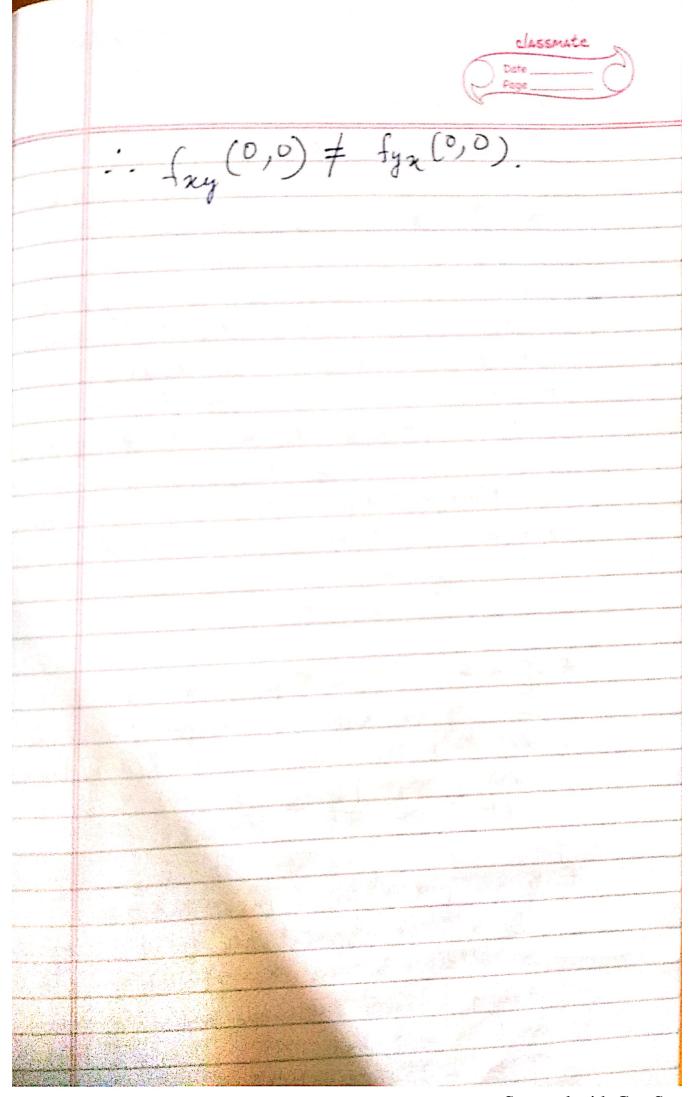
$$= 2t^{2t} + 2k^{2t} - 2k^{2t}$$

$$= 2t^{2t} + 2k^{2t} - 2k^{2t} - 2k^{2t}$$

$$= 2t^{2t} + 2k^{2t} - 2k^{2t} - 2k^{2t} - 2k^{2t}$$

$$= 2t^{2t} + 2k^{2t} - 2k^{2t} -$$





classmate derivative of a composite junction Functions of functions x, y, are independent variables, ne non consider functions Z= f(2,7, --) where x,y, --- are not independent variable but are functions of other variables u, u, so that 2 = g(u, v, ---), y = h(4, v, --If z = f(x,y) is a differentiable $fn - gx_i$ transformed independent variables u, vo then Z is a differentiable pr. of u, v and dz= 32 dx + 32 dy. * If z = f(x,y) is a fr-07 24 y 2 x, y be differentiable for Za single variable tie x= g(t), y=h(t), then dt = 22 da + 22 dy * If == s(x,y) be a fn- of x ly L x, y be differentiable y of z independent variables u & v, u, v, v = h(u, v), y = h(u, v)then Z possesses continuous partial derivatives wir.t u & v and 2 = 32 . 3x + 32 . 3y 3u $\frac{\partial 2}{\partial v} = \frac{\partial^2}{\partial x} \cdot \frac{\partial x}{\partial v} + \frac{\partial^2}{\partial y} \cdot \frac{\partial y}{\partial v}$

Total serinative

If u = f(x,y), where x = q(x) & y = y(x), then we can express u as a fn. of k alone by subdituting the values of x & y in f(x,y). Thus we can find the ordinary derivative du which is called the total derivative of u to distinguish it from the partial derivative $\frac{\partial u}{\partial x}$ to $\frac{\partial u}{\partial y}$.

Change of variable.

If
$$u = f(x, y)$$
, $x = \varphi(s, t)$, $y = \psi(s, t)$,

then $y = y = y$, $y = y = y$

then
$$\frac{\partial u}{\partial x} = \frac{\partial u}{\partial x} \cdot \frac{\partial x}{\partial x} + \frac{\partial u}{\partial y} \cdot \frac{\partial y}{\partial x}$$

(known as chain rule)

Ext. If
$$u = u(y-2, z-x, x-y)$$
, then prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.

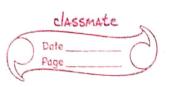
soln: Let
$$y=y-z$$
, $\lambda=z-x$, $t=x-y$, so that $u=u(x,s,t)$

$$\frac{\partial u}{\partial x} = \frac{\partial u}{\partial x} \cdot \frac{\partial x}{\partial x} + \frac{\partial u}{\partial x} \cdot \frac{\partial s}{\partial x} + \frac{\partial u}{\partial x} \cdot \frac{\partial t}{\partial x}$$

$$= \frac{\partial u}{\partial x} \cdot 0 + \frac{\partial u}{\partial x} \cdot (-1) + \frac{\partial u}{\partial t} \cdot 1$$

$$= -\frac{\partial u}{\partial x} + \frac{\partial u}{\partial t} \cdot \frac{1}{2t}$$

In 2 dy . dr + ou . os + du at = ou (1) + ou . (0) + ou . (-1) $= \frac{2u}{2x} - \frac{2u}{2t} - \frac{2}{2}$ $\frac{37}{27} = \frac{37}{91} \cdot \frac{35}{95} + \frac{36}{31} \cdot \frac{35}{95} + \frac{35}{31} \cdot \frac{35}{95}$ = 34 (-1) + 34 (1) + 34 (0) = - 34 + 34. -3 Adding (), (2 & 3), we get, 3x + 34 + 34 =0 (proved) $\frac{\partial x}{\partial x}$ $\frac{\partial y}{\partial y}$ $\frac{\partial y}{\partial y}$ $\frac{\partial y}{\partial z}$ $\frac{\partial y}{\partial z}$ Soln, Let a = v-x, b = v2-yr, c=v-z1 1. 29 = 0 => 29, 2a + 29, 26 + 29, 3c 20 => 29 (2020 -2x) +29 (2020 -0) +29 (2020 -0) zo



$$\frac{4}{7} \frac{v \partial \varphi}{\partial a} \cdot \frac{2v}{\partial x} - \frac{3\varphi}{\partial a} + \frac{v \partial \varphi}{\partial b} \cdot \frac{3v}{\partial x} + \frac{v \partial \varphi}{\partial c} \cdot \frac{v}{\partial c} = 0$$

$$\frac{a}{7} \frac{v \partial \varphi}{\partial x} \cdot \frac{v \partial v}{\partial x} \left(\frac{\partial \varphi}{\partial a} + \frac{3\varphi}{\partial b} + \frac{\partial \varphi}{\partial c} \right) = \frac{2\varphi}{\partial a}$$

$$\frac{a}{7} \frac{v}{7} \frac{2v}{7} \left(\frac{2\varphi}{\partial a} + \frac{3\varphi}{\partial b} + \frac{3\varphi}{\partial c} \right) = \frac{\partial \varphi}{\partial a}$$

$$\frac{a}{7} \frac{v}{7} \frac{3v}{7} = \frac{2\varphi}{7}$$

$$\frac{2\varphi}{2a} + \frac{2\varphi}{7b} + \frac{3\varphi}{7c}$$

$$\frac{2\varphi}{2a} + \frac{3\varphi}{7b} + \frac{3\varphi}{7c}$$

$$\frac{2\varphi}{7c} + \frac{3\varphi}{7c}$$

$$\frac{2\varphi}{7c$$

