PES UNIVERSITY	**Unit 1: Partial Differentiation Assignment**	**2023**

Class - 3

Total derivative, chain rule, composite functions, problems

1.Given u=sin(x/y) where x=e^t, y=t^2, find the total derivative of u w.r.t t.

$$\boldsymbol{Ans}: \frac{du}{dt} = \left(1 - \frac{2}{t}\right)\frac{e^t}{t^2}\cos\left(\frac{e^t}{t^2}\right)$$

2.If $z = xy^2 + x^2y$ where $x = at^2$ and $y = 2at, find$ $\frac{dz}{dt}$. Verify the result by direct substitution.

3.If $z = 2xy^2 - 3x^2y$ and if x increases at the rate of 2cm. per second and it passes through the value x=3cm, show that if y is passing through the value y=1cm., y must be decreasing at the rate of $2\frac{2}{15}$cm. per second, in order that z shall remain constant.

4.If z=f(x,y) where $x = e^u cosv, y = e^u sinv$, show that

i) $y\frac{\partial z}{\partial u} + x\frac{\partial z}{\partial v} = e^{2u}\frac{\partial z}{\partial y}$ ii) $(\frac{\partial z}{\partial x})^2 + (\frac{\partial z}{\partial y})^2 = e^{-2u}\left[(\frac{\partial z}{\partial u})^2 + (\frac{\partial z}{\partial v})^2\right]$

5. If $u = f(r,s,t)$ and $r = \frac{x}{y}, s = \frac{y}{z}$ and $t = \frac{z}{x}, show$ $that$ $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$