[Summary]

[Partial Differentiation of Functions of Function and Implicit Function]

Subject:	Business Economics
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Paper No. & Title:	Paper – 631 Advanced Mathematical Techniques
Unit No. & Title:	Unit – 2 Function of Two Variables
Lecture No. & Title:	Lecture – 2 Partial Differentiation of Functions of Function and Implicit Function

Summary

- $\frac{\partial u}{\partial x}$ is the change in u due to a small change in x keeping y constant.
- $\frac{dx}{dt}$ denotes the change in x due to a small unit change in t.
- $\frac{\partial u}{\partial x}\frac{dx}{dt}$ will be the amount of change in u due to a small change in t that is transmitted through x.
- $\frac{\partial u}{\partial y}\frac{dy}{dt}$ will be the amount of change in u due to a small

  change in t that is transmitted through y.
- The change in u due to a small change in t will be linear sum of these two effects and it is called the total derivative of u with respect to t.
- For u = f(x,y), x = g(t), y = h(t) where t is the independent variable. The second order total differentiation is given by

$$\frac{d^2u}{dt^2} = u_{xx}\left(\frac{dx}{dt}\right)^2 + u_{yy}\left(\frac{dy}{dt}\right)^2 + u_x\frac{d^2x}{dt^2} + u_y\frac{d^2y}{dt^2} + 2u_{xy}\frac{dx}{dt}\frac{dy}{dt}.$$

- A function is said to be homogeneous function of degree n if f (tx,ty) = $t^n f(x,y)$.
- Euler's Theorem: Let u = u(x,y) be a homogeneous function of degree n. Then $xu_x + yu_y = nu$.
- Let $q_a = u(P_a, P_b)$ where q_a is the quantity of good A demanded, P_a is its price, and P_b is the price of good B.

  Price elasticity is defined as $\eta = -\frac{\partial q_a}{\partial P_a}\frac{P_a}{q_a}$.