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EXCELLENCE PROGRAM-SYJC (COMMERCE), 2019-20
SYNOPSIS
MATHEMATICS AND STATISTICS - PART 1

APPLICATION OF DERIVATIVE [10 MARKS FOR H.S.C.]

1) INCREASING FUNCTION:

Any function $y = f(x)$ is increasing function at $x = c$ if $\frac{d}{dx}(c) > 0$.

Steps : i) Find $\frac{dy}{dx}$

ii) Take $\frac{dy}{dx} > 0$ and find the values of x.

2) DECREASING FUNCTION:

Any function $y = f(x)$ is decreasing function at $x = c$ if $\frac{d}{dx}(c) < 0$.

Steps : i) Find $\frac{dy}{dx}$

ii) Take $\frac{dy}{dx} < 0$ and find the values of x.

3) MAXIMA AND MINIMA:

a) MAXIMUM VALUE OF A FUNCTION:

A function $y = f(x)$ is said to have **local maximum** at $x = c$, if $\boldsymbol{f'(c) = 0 \text{ and } f''(c) < 0}$.

Steps : 1) Find $\frac{dy}{dx}$

2) Take $\frac{dy}{dx} = 0$ and find the values of x.

3) Find $\frac{d^2 y}{dx^2}$, substitute the values of x in $\frac{d^2 y}{dx^2}$.

4) If $\frac{d^2 y}{dx^2} < 0$ then $y = f(x)$ has maximum value at x.

5) Substitute the value of x in $y = f(x)$ which is maximum value of the function.

b) MINIMUM VALUE OF A FUNCTION:

A function $y = f(x)$ is said to have **local minimum** at $x = c$, if $f'(c) = 0$ **and** $f''(c) > 0$.

Steps :1) Find $\frac{dy}{dx}$

2) Take $\frac{dy}{dx} = 0$ and find the values of x.

3) Find $\frac{d^2y}{dx^2}$, substitute the values of x in $\frac{d^2y}{dx^2}$.

4) If $\frac{d^2y}{dx^2} > 0$ then $y = f(x)$ has minimum value at x.

5) Substitute the value of x in $y = f(x)$ which is minimum value of the function.

APPLICATION OF DERIVATIVE IN ECONOMICS:

1) Demand Function $D = f(P)$
   Marginal demand $D_m = \frac{dD}{dP}$

2) Supply function $S = g(P)$
   Marginal supply $= \frac{dS}{dP}$

3) Total cost $C = f(x)$, x is number of items
   Marginal cost $C_m = \frac{dC}{dx}$
   Average cost $C_A = \frac{C}{x}$

4) Total Revenue $R = P.D, P = price, D = demand.$
   Average Revenue $R_A = \frac{R}{D} = \frac{PD}{D} = P$
   Total Profit $\pi = R - C$

5) Elasticity of demand $\eta = \frac{-P}{D} \cdot \frac{dD}{dP}$

i) If $\eta = 0$, demand is perfectly inelastic.

ii) If $0 < \eta < 1$, demand is relatively inelastic.

iii) If $\eta = 1$, demand is exactly proportional to the price, is said to be unitary elastic.

iv) If $\eta > 1$, demand is relatively elastic.

6) Marginal Revenue $R_m = R_A(1 - \frac{1}{\eta})$

7) $E_c = f(x) =$ Consumption expenditure

Marginal propensity to consume (MPC) $= \frac{dE_c}{dx}$

Average propensity to consume (APC) $= \frac{E_c}{x}$

Marginal propensity to save (MPS) $= \frac{dS}{dx}$

Average propensity to save (APS) $= \frac{S}{x}$

Where MPC + MPS = 1 and APC + APS = 1