Dr.SNS RAJALAKSHMI COLLEGE OF ARTS AND SCIENCE
(Autonomous)
Accredited by NAAC – UGC with 'A+ Grade (Cycle IV)
(Recognised by UGC, Approved by AICTE & Affiliated to Bharathiar University)
Coimbatore- 49

DEPARTMENT OF MATHEMATICS

21UCR304: BUSINESS CALCULUS AND FINANCIAL COMPUTATION

APPLICATION TO BUSINESS PROBLEMS

Dr.K.Sasikala,

Assistant Professor,

Department of Mathematics

Why Differentiation is Useful in Business

- Helps maximize profit
- Helps minimize cost
- Optimizes production and pricing
- Assists in investment decisions
- Improves resource allocation

Key Formulas

- **Profit Function:** $P(x) = R(x) - C(x)$
- **Revenue Function:** $R(x) = \text{Price} \times \text{Quantity}$
- **Cost Function:** $C(x) =$ Total cost depending on output
- **Critical Points:** Solve $P'(x) = 0$ or $C'(x) = 0$

Steps to Solve Business Optimization Problems

1. Express **Profit / Cost / Revenue** as a function of output (x)
2. Find **first derivative**
3. Solve derivative = 0 → Critical points
4. Use **second derivative test:**
   - $f''(x) > 0$ → Minimum
   - $f''(x) < 0$ → Maximum
5. Evaluate function at critical points

Problem 1: Maximum Profit

Revenue: $R(x) = 50x - x^2$

Cost: $C(x) = 10x + 100$

Profit: $P(x) = R(x) - C(x) = 40x - x^2 - 100$

1. First derivative: $P'(x) = 40 - 2x$
2. Set $P'(x) = 0 \rightarrow x = 20$
3. Second derivative: $P''(x) = -2 < 0 \rightarrow$ Maximum
4. Maximum profit: $P(20) = 300$

Problem 2: Minimum Cost

Cost Function: $C(x) = 5x^2 - 20x + 150$

1. First derivative: $C'(x) = 10x - 20$
2. Set $C'(x) = 0 \rightarrow x = 2$
3. Second derivative: $C''(x) = 10 > 0 \rightarrow$ Minimum
4. Minimum cost: $C(2) = 130$

Cost vs Profit Analysis

Revenue: $R(x) = 120x - 3x^2$

Cost: $C(x) = 30x + 400$

Profit: $P(x) = R(x) - C(x) = 90x - 3x^2 - 400$

1. First derivative: $P'(x) = 90 - 6x$
2. Solve $P'(x) = 0 \rightarrow x = 15$
3. Second derivative: $P''(x) = -6 < 0 \rightarrow$ Maximum profit
4. Maximum profit: $P(15) = 9015 - 3225 - 400 = 725$

THANK YOU