경제수학 제 6 장

최대값, 최소값

Derivatives and Turning Points

- Sign of $\frac{dy}{dx}$ around a turning point:

	before	at critical value	after
• Maximum	+	0	–
• Minimum	–	0	+

Second Derivative of a Function

- After obtaining $\frac{dy}{dx}$ the first derivative of the function we differentiate that and the result is called the second derivative of the original function

$$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right)$$

- Second derivative: is obtained by differentiating a derivative

To Identify Possible Turning Points:

- Differentiate, set $\frac{dy}{dx}$ equal to zero and solve for x
- Find $\frac{d^2y}{dx^2}$ and look at its sign to distinguish a maximum from a minimum
- The first and second order conditions are:

	Maximum	Minimum
$\frac{dy}{dx}$	0	0
$\frac{d^2y}{dx^2}$	–	+

변곡점 (Point of Inflexion)

- There is also the possibility that d^2y/dx^2 may be zero
- In this case we have neither a maximum nor a minimum
- Here the curve changes its shape, bending in the opposite direction
- This is called a point of inflexion

Maximum Total Revenue

- For maximum total revenue
- Differentiate the TR function with respect to output, Q
- Set the derivative equal to zero and solve for Q
- Find the second derivative $\frac{d^2TR}{dQ^2}$ and check that it is negative

Maximum Profit

- For maximum profit, p = TR – TC
- Substitute the expressions for TR and TC in the profit function so p = f(Q)
- Differentiate the profit function with respect to output, Q
- Set the derivative equal to zero and solve for Q
- Find the second derivative $\frac{d^2\pi}{dQ^2}$ and check that it is negative

Minimum Average Cost

- At the minimum point of AC
  AC = MC

- Marginal Cost intersects Average Cost at the minimum point of the AC curve

Average and Marginal Product of Labor

- When average product is maximized,
  APL=MPL
- The MPL curve intersects the APL curve at that point
- MPL reaches a maximum at a lower value of L than that where APL is a maximum
- After the maximum of MPL there are diminishing marginal returns, since the marginal product of labor is falling