Recitation 5 Notes
14.01SC Principles of Microeconomics

I. Production Functions: $Q = f(L,K)$

a.) Cobb-Douglas production function

$Q = L^{½} K^{½}$

$MP_L = \Delta Q/\Delta L = \partial Q/\partial L = ½(K/L)^{½}$

$MP_K = \partial Q/\partial K = ½K^{½}L^{½} = ½(L/K)^{½}$

Marginal rate of technical substitution = $-dK/dL$

$(MRTS) = MP_L / MP_K$

$= (.5*(K/L)^{.5})/ (.5*(L/K)^{.5})$

$= K/L$

Returns to scale are constant.

b.) Leontief

$Q = \min(aL, bK)$

$aL = bK$

II. Costs (forward-looking)

a.) Short Run Costs

K is fixed

Fixed cost (FC) = r * k

Variable cost (VC) = w * L

Marginal cost (MC) = $\Delta C/\Delta Q = dC/dQ$

Average fixed cost (AFC) = FC/Q

Average variable cost (AVC) = VC/Q

Average total cost (ATC) = AFC + AVC

Short run cost (SRC) = r * K + w * L

b.) Long Run Costs

MRTS = w/r

$MP_L / MP_K = w/r \rightarrow MP_L/w = MP_K/r$

Long run costs: LRC(Q) = r*K(Q) + w*L(Q)

Increasing returns to scale if Q increases and AC decreases

Decreasing returns to scale if Q decreases and AC increases

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