Review Notes – Production, Technology and Profit Maximization

- The Production Function.

  - $Y = f(L, K, N, E)$ – what does this mean?
  - Graphically
  - What is the production set?

- Isoquants

  - Definition given $Y^* = f(L, K)$: Shows all combinations of L and K that give output Y^*.
  - What are some examples of isoquants?
  - Assumptions about production
    - Free Disposal or Monotonic Technology
    - Convexity of isoquants
    - Why do these assumptions make sense?
  - Other Definitions
    - Marginal Product of the any input equals?
    - Technical Rate of Substitution? Slope of the isoquant curve and equals what?
    - Short- run vs. Long-run in production
    - Returns to Scale
      - Constant Returns to Scale
      - Decreasing Returns to Scale
      - Increasing Returns to Scale
      - What is the difference between returns to scale and diminishing returns?

- Profit Maximization

  - Definitions
    - Total Revenue
    - Total Costs
      - Which costs are included?
    - Profit
      - Economic profit vs. accounting profit
    - Types of Inputs
      - Variable inputs
      - Fixed inputs
      - Quasi-fixed inputs

  - Short-run profit maximization
    - Assume 2 inputs, one variable (L) and one fixed (K)
    - Firm problem is to max profit (π) subject to $Y = f(L, K)$ with K fixed
      - $\pi = Pf(L,K) - wL - rK$
      - What is an isoprofit curve?
        - $Y = \pi/P + wL/P + rK/P$

- What does the isoprofit look like graphically?
- How many isoprofit curves are there?
- What is its slope and intercept?
- What is the slope of the production function in the short – run?
- Maximizing profit requires that the isoprofit be tangent to the production function. Why?
  - In other words => $MP_L = w/P$
  - What happens to input usage when P, L, MP_L change in the short-run? Graphically? Mathematically?

- Long-run profit maximization
  - Maximizing profit requires that the isoprofit be tangent to the production function for both inputs. Why?
    - In other words <u>both</u> conditions must hold simultaneously
      - $MP_L = w/P$
      - $MP_K = r/P$
      - Or $MP_L/w = MP_K/r$
      - Or $w/MP_L = r/MP_K$
      - Make sure you know how to interpret both conditions, how they work, how they are similar, how they are different.
      - $L^* = f(P,w,r)$; $K^* = f(P,w,r)$ are the factor demand curves. What are these? Where do they come from?
      - What are inverse factor demand curves?
  - What does profit maximization imply about returns to scale?
  - Revealed profitability
    - What's that?
    - Definition/equations – WARP – Weak Axiom of Revealed Profitability
    - Implications of WARP with respect to:
      - Firm Supply of the Product
      - Firm Demand for the inputs
    - How can one use WARP to derive production functions?
- What does profit maximization imply about costs?