1. A. Derive an indifference curve by the theory of revealed preference.
   B. What is the importance of this theory? Its limitations?

2. For a Cobb-Douglas production function with two inputs, labor and capital:
   a. Derive the APP_K,MPP_K,APP_L,MPP_L;
   b. Plot the APP_K and the MPP_L and indicate State II of production for K;
   c. Derive the output elasticity of K and L.
   d. Derive the relative shares of output going to each.
   e. What is the elasticity of substitution of L for K?
   f. Derive the capital-labor ratio.
   g. Proof that if Cobb Douglas shows constant returns to scale and each input is paid by its marginal utility then the output is exhausted. (No profit, all costs covered).
   h. Given the two inputs and total outlays budget constraint, derive the long run profit maximization.
   i. Given the two inputs and total outlays budge constraint, derive the long run cost minimization.
   j. How does the answer to (h), change if the company has no budget constraint?

3. Given the following short-run cost function:

   $$C=0.04q^3 - 0.9q^2 + 10q + 5$$

   And the constant price of the final commodity of $4 for the firm, determine:
   a. The best level of output for the firm;
   b. The level of profit the firm makes at this level of output;
   c. Does the firm continue to produce or shut down? Why?

4. Suppose that a firm is a perfect competitor in both the product and factory markets and uses two factors of production, one fixed and one variable:
   a. Derive mathematically the first order condition showing how much of the variable factor the firm should use to maximize total profits.
   b. Give a graphical interpretation of your answer to part (a). What characteristic of your figure indicates that the second order condition for maximization is satisfied?
   c. How does the answer to (a) change in IMperfect competition?

d. How does the answer to (c) change if both factors of production are variable?

5. Given a utility function U (q_1q_2) and a budget constraint of $\$2q_1 + \$5q_2=100$.

   a. Derive q_1 and the demand curve d_1 by substitution.

   b. Derive q_1 and the demand curve d_1 by the Lagrangian Method.

   c. What is the meaning of lambda in part (b).

6. A. Derive the demand curve for a normal good.
   B. Derive the Marshallian, Hicksian and Slutsky demand curves and elaborate on their differences. Which is the most accurate?

7. Given the price of $12 for good A, and an elasticity of -3, and an elasticity of good B of -2. What is the price of good B?

8. A. Comment on the statement: “A monopolist produces an inelastic demand curve”.
   B. How can a monopoly be regulated? What are the impacts on output?
   C. What are the conditions for perfect competition? Does it exist in reality? Explain why/why not it is used.

9. Explain the types of price discrimination.

10. Derive the fact that a demand curve is homogenous to degree zero.

11. Proof that the Cobb Douglas production function is homogenous to degree one.

12. Given a welfare economic system, show how the grand utility frontier can be visually be derived. Has there been criticism in the utilization of the theory? How many variables can the system explain?