ECONOMICS 100A: MICROECONOMICS

Fall 2002 **Tu, Th 8:00am-9:20am** **Peterson Hall 110**
Th 6:00pm-7:20pm **Peterson Hall 110**

Prof: Mark Machina Office: Econ. Bldg. 217 Hours: Tues 9:30-1:30

TA's: Philip Babcock Econ Bldg 120 Thur 9:30-10:30, 12-1
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DATE	TOPIC	TEXTBOOK / MATH HANDOUT
Sep. 26	Introduction & Mathematical Review #1	Chs. 1,2 / Sect. A
Sep. 26	Mathematical Review #1 (continued)	B,C
Oct. 1	Consumer Preferences: Utility Functions and Indifference Curves I	3
Oct. 3	Consumer Preferences: Utility Functions and Indifference Curves II	3
Oct. 3	Mathematical Review #2	D
Oct. 8	Mathematical Review #2 (continued)	E
Oct. 10	Utility Maximization and Demand Functions I	4
Oct. 10	Utility Maximization and Demand Functions II	4
Oct. 15	Comparative Statics of Demand I	5
Oct. 17	Comparative Statics of Demand II	6
Oct. 17	Comparative Statics of Demand III	7
Oct. 22	**(Tuesday) 1st Midterm Exam Mandeville Auditorium 8:00-9:20am**	
Oct. 24	Supply of Factors of Production I	22
Oct. 24	Supply of Factors of Production II	23
Oct. 29	Theory of Production I	11
Oct. 31	Theory of Production II	11
Oct. 31	Theory of Cost I	12
Nov. 5	Theory of Cost II	12
Nov. 7	Theory of Cost III	12
Nov. 7	Mathematical Review #3	F
Nov.12	Profit Maximization and Supply Under Perfect Competition I	13
Nov.14	Profit Maximization and Supply Under Perfect Competition II	13
Nov.14	Profit Maximization and Supply Under Perfect Competition III	13
Nov.19	Equilibrium and Dynamics of Perfectly Competitive Markets I	14
Nov.21	**(Thursday) 2nd Midterm Exam Mandeville Auditorium 8:00-9:20am**	
Nov.26	Equilibrium and Dynamics of Perfectly Competitive Markets II	14
Dec. 3	Equilibrium and Dynamics of Perfectly Competitive Markets III	15
Dec. 5	Demand for Factors of Production I	21
Dec. 5	Demand for Factors of Production II	21
Dec. 10	**(Tuesday) FINAL EXAM 8:00-11:00am (location to be announced)**	

TEXT & READINGS: *Microeconomic Theory: Basic Principles & Extensions,* 8th ed., Walter Nicholson, Southwestern Thomson Learning, 2002. You are responsible for all the material in the assigned chapters. There is also a Soft Reserve package, with a Mathematical Handout that contains required material for the course.

EXAMS: Grades are determined on the basis of two Midterm Exams and the Final Exam.

PRACTICE PROBLEMS: A large set of old exam problems is included in the Soft Reserve package. You are urged to practice on them, in preparation for the actual exams.

Web Page (including e-mail links): http://weber.ucsd.edu/~mmachina/courses/100A/100A.html

ECON 100A COURSE OUTLINE – Fall 2002

I. INTRODUCTION

- **a. Domain of Microeconomic Analysis**
- **b. Circular Flow Diagram**
- **c. Stocks vs. Flows and the Dimensions of Economic Variables**

II. MATHEMATICAL REVIEW #1

- **a. Calculus Review** (Math Handout, Section A)
  - Derivatives, Partial Derivatives and the Chain Rule
  - Approximation Formulas for Small Changes in Functions (Total Differentials)
- **b. Elasticity** (Math Handout, Section B)
  - Absolute, Proportionate and Percentage Changes in Variables
  - Definition of Elasticity and Examples
  - Constant Elasticity Functions
- **c. Level Curves of Functions** (Math Handout, Section C)
  - Definition and Graphical Illustration
  - Algebraic Formula for a Level Curve
  - Formula for the Slope of a Level Curve

III. CONSUMER PREFERENCES: UTILITY FUNCTIONS & INDIFFERENCE CURVES

- **a. Commodities and Commodity Bundles**
  - Commodities are Typically *Flows,* not *Stocks*
  - Issue of Divisibility
- **b. Utility Functions**
  - Preferences are Defined over Commodity Bundles, *not* Individual Commodities
  - Utility Functions and Total Utility Curves
    - Important Examples: Linear, Cobb-Douglas, Leontief
  - Marginal Utility and Marginal Utility Curves
    - Hypothesis of Diminishing Marginal Utility
- **c. Indifference Curves and the Marginal Rate of Substitution**
  - Deriving a Consumer's Indifference Curves from Their Utility Function
  - General Properties of Indifference Curves:
    - One Through Every Commodity Bundle
    - Downward Sloping and Can't Cross
  - Marginal Rate of Substitution (MRS)
    - Graphical Interpretation: Slope of the Indifference Curve
    - Algebraic Formula: Ratio of Marginal Utilities
    - Hypothesis of Diminishing Marginal Rate of Substitution

IV. MATHEMATICAL REVIEW #2

- **a. Solving Optimization Problems** (Math Handout, Section D)
  - General Structure of Optimization Problems
  - First and Second Order Conditions for Unconstrained Optimization Problems
  - First Order Conditions for Constrained Optimization Problems
- **b. Scale Properties of Functions (Math Handout, Section E)**

V. UTILITY MAXIMIZATION AND DEMAND FUNCTIONS

a. Utility Maximization Subject to a Budget Constraint

- Graphical Illustration
- First Order Conditions for Utility Maximization
  - Two Interpretations of the First Order Conditions
- Second Order Conditions (Hypothesis of Diminishing MRS)
- Algebraic Examples: Cobb-Douglas, Leontief, Linear
- Corner Solutions: Graphical Illustration and Algebraic Condition

b. Regular ("Marshallian") Demand Curves and Demand Functions

- Definition of Regular Demand Functions
  - Examples: Cobb-Douglas, Leontief, Linear
- General Properties of Demand Functions:
  - Walras' Law
  - Scale Invariant in Prices and Income
  - Relationship between Price Elasticities & Income Elasticity for a Good
- Market Demand Functions

VI. COMPARATIVE STATICS OF DEMAND

a. Income Changes

- Income-Consumption Locus
- Engel Curves: Definition and Graphical Derivation
- Income Elasticity
  - Superior, Normal and Inferior Goods
  - Income Elasticity and Budget Shares
  - Relationship Between Income Elasticities of All Goods
- Algebraic Derivation of the Effect of an Income Change

b. Price Changes

- Price-Consumption Locus
- Graphical Derivation of Marshallian Demand Curves
- Own Price Elasticity
  - Price Elasticity and Expenditures
- Cross Price Elasticity
  - Gross Substitutes and Gross Complements
- Algebraic Derivation of the Effect of a Price Change

c. Compensated Price Changes and Compensated ("Hicksian") Demand Functions

- Graphical Illustration of a Compensated Price Change
- Graphical Derivation of Compensated Demand Curves
- Algebraic Derivation of Compensated Demand Functions
  - Examples: Cobb-Douglas, Leontief
- Algebraic Derivation of the Effect of a Compensated Price Change

d. Slutsky Equation

- Expressing Each of the Three Basic Changes in Terms of the Other Two
- Graphical Illustration
- Algebraic Formulation and Informal Proof
- Giffen Goods

VII. SUPPLY OF FACTORS OF PRODUCTION

a. Supply of Labor: The Labor-Leisure Decision

- Income-Leisure Space and the Labor-Leisure Decision
- First Order Conditions for Optimal Supply of Labor
- Comparative Statics: Income and Substitution Effects
- Backward Bending Supply of Labor Curves
- Kinked Budget Lines and the Overtime Decision

b. Supply of Capital: The Consumption-Savings Decision

- Intertemporal Income and Consumption Streams
- Interest Rates and Discounted Present Value of a Stream
- Intertemporal Utility Maximization
  - First Order Conditions and Interpretation
- Comparative Statics: Income and Substitution Effects

VIII. THEORY OF PRODUCTION

a. Production Functions

- Types of Factors and Their Income
- Important Examples: Linear, Leontief, Cobb-Douglas
- Total Product Curves

b. Marginal Products and the Law of (Eventually) Diminishing Marginal Product

- Definition of Marginal Product
- Marginal Product Curves
  - Examples: Linear, Leontief, Cobb-Douglas
- Hypothesis of Diminishing Marginal Product of a Factor

c. Average Products and the Average-Marginal Relationship

- Definition of Average Product
- Average Product Curves
  - Examples: Linear, Leontief, Cobb-Douglas
- Average-Marginal Relationship ("Grade Point Average Theorem")
  - Proof of the Average-Marginal Relationship

d. Isoquants and the Marginal Rate of Technical Substitution (MRTS)

- Definition and General Properties of Isoquants
  - Examples: Linear, Cobb-Douglas, Leontief
- Definition of the Marginal Rate of Technical Substitution
  - Expressing the MRTS in Terms of Marginal Products
  - Examples: Linear, Leontief, Cobb-Douglas
- Hypothesis of Diminishing MRTS

e. Returns to Scale

IX. THEORY OF COST

a. Nature of Cost

- Definition of Cost
- Accounting Cost vs. Opportunity Cost of Owned Factors
  - Numerical Example
- Cost of Entrepreneurial Ability and Definition of "Economic Profits"
- Short Run Planning versus Long Run Planning

b. Short Run Cost Functions

Expansion Path in the Short Run
Graphical Derivation of the Short Run Total Cost Curve
Algebraic Derivation of Short Run Total Cost Function (STC)
Examples: Linear, Leontief, Cobb-Douglas
Short Run Variable Cost Function (SVC)
Short Run Fixed Cost Function (SFC)
Short Run Marginal Cost Function (SMC)
Relation of SMC to Marginal Product of Labor and Wage Rate
Short Run Average Total Cost Function (SATC)
Short Run Average Variable Cost Function (SAVC)
Short Run Average Fixed Cost Function (SAFC)
Average-Marginal Relationships

c. Long Run Cost Minimization

Isocost Lines
Graphical Illustration of Long Run Cost Minimization
First Order Conditions for Long Run Cost Minimization
Two Interpretations of the First Order Conditions
Second Order Conditions (Hypothesis of Diminishing MRTS)
Output-Constrained Factor Demands

d. Long Run Cost Functions

Expansion Path in the Long Run
Graphical Derivation of the Long Run Total Cost Curve
Algebraic Derivation of Long Run Total Cost Function (LTC)
Properties of Long Run Total Cost Functions:
Increasing in Output
Nondecreasing in Factor Prices
Constant Returns to Scale in Factor Prices
Examples: Linear, Leontief, Cobb-Douglas
Long Run Marginal Cost Function (LMC)
Relation of LMC to all Marginal Products and Factor Prices
Long Run Average Cost Function (LAC)
Average-Marginal Relationship
Returns to Scale and Long Run Average Cost

e. Relationship Between Long Run and Short Run Cost Curves

Long and Short Run Total Cost Curves
Long and Short Run Average Cost Curves
Long and Short Run Marginal Cost Curves

X. MATHEMATICAL REVIEW #3

a. Comparative Statics of Solution Functions (Math Handout, Section F)

b. Comparative Statics of Equilibria (Math Handout, Section F)

c. Comparative Statics of Optimal Value Functions (Math Handout, Section G)

XI. PROFIT MAXIMIZATION AND SUPPLY UNDER PERFECT COMPETITION

a. Long Run Profit Maximization and Long Run Supply

- Long Run Profit Maximization (Graphical Illustration and Algebraic Formulation)
  - First Order Conditions and Interpretation
  - Second Order Condition (Increasing Marginal Cost)
- Graphical Derivation of the Long Run Supply Curve
- Algebraic Formulation of Long Run Supply Function
  - Examples: Cobb-Douglas, Cubic LTC, Constant Returns to Scale
- Properties of Long Run Supply Functions:
  - Increasing in Output Price
  - Nonincreasing in Factor Prices
  - Scale Invariant in Output Price and Factor Prices
- Long Run Elasticity of Supply

b. Short Run Profit Maximization and Short Run Supply

- Short Run Profit Maximization and the Shut Down Decision
  - Illustration in Terms of STC and SVC Curves
  - Illustration in Terms of SATC and SAVC Curves
- Short Run Supply Curve of the Firm
- Short Run Supply Function of the Firm
  - Example: Cubic STC, Cobb-Douglas Example
- Properties of Short Run Supply Functions:
  - Increasing in Output Price
  - Nonincreasing in Factor Prices
  - Scale Invariant in Output Price and Factor Prices
- Short Run Market Supply

XII. EQUILIBRIUM, DYNAMICS AND COMPARATIVE STATICS OF PERFECTLY COMPETITIVE MARKETS

a. Assumptions of Perfect Competition and the "Law of One Price"

- Large Number of Buyers and Sellers
- Homogeneous Commodity
- Perfect Information
- Free Entry and Exit in the Long Run
- Law of One Price

b. Equilibrium in Perfectly Competitive Markets

- Market Equilibrium in the Very Short Run
- Market Equilibrium in the Short Run
- Market Equilibrium in the Long Run
  - Long Run Supply Curve of the Market
  - Properties of Long Run Competitive Equilibrium

c. Dynamics of Market Adjustment

d. Comparative Statics of Perfectly Competitive Markets

- Shifts in Supply and Demand Functions
  - What Determines How Much Price vs. Quantity Adjusts?
- Taxes and Subsidies
  - Who Bears the Burden of a Tax?
- Price Floors and Price Ceilings

XIII. DEMAND FOR FACTORS OF PRODUCTION

a. Maximizing Profits by Choosing Optimal Input Levels

Marginal Value Product of a Factor of Production

b. Short Run Factor Demand

First Order Condition for Short Run Profit Maximization

Short Run Factor Demand Functions

Nonincreasing in Own Factor Price

Scale Invariant in Output Price and Factor Prices

Relation to Short Run Supply Function

c. Long Run Factor Demand

First Order Conditions for Long Run Profit Maximization

Long Run Factor Demand Functions

Nonincreasing in Own Factor Price

Scale Invariant in Output Price and Factor Prices

Relation to Long Run Supply Function

ECON 100A FAMOUS OPTIMIZATION PROBLEMS

Optimization Problem	Objective Function	Constraint	Control Variables	Parameters	Solution Functions	Optimal Value Function
Consumer's Problem	$U(x_1,\ldots,x_n)$ utility function	$p_1 \cdot x_1 + \ldots + p_n \cdot x_n = I$ budget constraint	$x_1,\ldots,x_n$ commodity levels	$p_1,\ldots,p_n, I$ prices and income	$x_i(p_1,\ldots,p_n,I)$ regular demand functions	$V(p_1,\ldots,p_n,I)$ indirect utility function
Expenditure Minimization Problem	$p_1 \cdot x_1 + \ldots + p_n \cdot x_n$ expenditure level (J.'s 'allowance')	$U(x_1,\ldots,x_n) = u_0$ desired utility level	$x_1,\ldots,x_n$ commodity levels	$p_1,\ldots,p_n, u_0$ prices and utility level	$h_i(p_1,\ldots,p_n,\overline{u})$ compensated demand functions	$e(p_1,\ldots,p_n,u_0)$ expenditure function
Labor/Leisure Decision	$U(H,I)$ utility function	$I = I_0 + w \cdot (168 - H)$ budget constraint	H, I leisure time, disposable inc.	w, I_0 wage rate and nonwage income	$168 - H(w,I_0)$ labor supply function	$V(w,I_0)$ indirect utility function
Consumption/ Savings Decision	$U(c_1,c_2)$ utility function	$c_2 = I_2 + (1+i) \cdot (I_1 - c_1)$ budget constraint	c_1, c_2 consumption levels	I_1, I_2, i income stream and interest rate	$c_1(I_1,I_2,i)$, $c_2(I_1,I_2,i)$ consumption functions	$V(I_1,I_2,i)$ indirect utility function
Long Run Cost Minimization	$w \cdot L + r \cdot K$ total cost	$F(L,K) = Q$ desired output	L, K factor levels	Q, w, r desired output and factor prices	$L(Q,w,r)$, $K(Q,w,r)$ output-constrained factor demand functions	$LTC(Q,w,r)$ long run total cost function
Long Run Profit Maximization (in terms of Q)	$P \cdot Q - LTC(Q,w,r)$ total profit	none	Q output level	P, w, r output price and factor prices	$Q(P,w,r)$ long run supply function	$\pi(P,w,r)$ long run profit function
Long Run Profit Maximization (in terms of L and K)	$P \cdot F(L,K) - w \cdot L - r \cdot K$ total profit	none	L, K factor levels	P, w, r output price and factor prices	$L(P,w,r)$, $K(P,w,r)$ factor demand functions	$\pi(P,w,r)$ long run profit function