

ECO 305 – Fall 2003
Microeconomic Theory – A Mathematical Approach
Midterm Examination

Important instructions: [1] This is a closed-book examination. Put away your books, handouts, notes, calculators, palmtops, cellular phones, . . . **now**. [2] **Print** your name and your preceptor's name clearly on the front cover of each answer booklet. Write your answers clearly. We won't grade unreadable answers. [3] Write and sign the honor pledge – "I pledge my honor that I have not violated the honor code during this examination." – on the front cover of your answer booklet.

Question 1 — 20 minutes, 20 points

Define **any four** of the following:

- (a) Transitive preferences
- (b) Diminishing marginal rate of substitution
- (c) Indirect utility function
- (d) Elasticity of substitution
- (e) Decreasing returns to scale in production
- (f) A firm's (dual) cost function

Question 2 — 25 minutes, 30 points

Answer **any two** of the following:

(a) In a problem of maximization of a function of two variables subject to one equation constraint, derive the interpretation of a Lagrange multiplier as a shadow price, that is, the derivative of the optimal value of the objective function with respect to the constant in the constraint.

(b) Derive the Slutsky equation.

(c) Briefly outline the different kinds of empirical evidence bearing on consumer behavior, and say whether each type of evidence supports or contradicts the theory of utility maximization. (Do not try to reproduce any numerical tables from memory, just state the general conclusions.)

Continued on reverse

Question 3 — 45 minutes, 50 points

Note: You are **not** allowed to use a calculator, but can use the following information: $14^4 = 38416$, $18^3 = 5832$.

Denote a consumer's daily hours of work by H , and hours of non-work by $N = 24 - H$. Consider a consumer who has no other source of income than wages for hours worked, and no debt or other obligations. He consumes what he earns each day. Writing C for the dollar amount of his consumption, suppose his utility function is

$$U(C, N) = \ln(C) + 3 \ln(N).$$

All these quantities are to be treated as continuous variables.

(a) Suppose the wage rate is \$10 per hour. Write down the consumer's utility function and budget constraint with C and H as the choice variables. How many hours will he choose to work, and what will be the resulting utility?

(b) Suppose the wage rate is \$10 per hour for the first 8 hours of work each day, and \$30 per hour for each daily hour of work beyond the first 8. Write down the consumer's utility function and budget constraint with C and H as the choice variables. How many hours will he choose to work, and what will be the resulting utility?