Name: _____ Student Number: _____

Faculté des sciences sociales | Faculty of Social Sciences

uOttawa

Département de science économique
Department of Economics

ECO 2144C (Microeconomic Theory I)
Final Exam

Thursday, April 17, 2014
Time to complete the exam: 3 hours

Instructions: Fill in your name/initials and student number on every page of this questionnaire. There are 46 questions in total – 37 multiple choice, 4 true/false and 5 short answer. This midterm exam has 12 pages – check that your copy has all of them. You may use a non-programmable calculator. Good luck !!

MULTIPLE CHOICE. (74 points – 2 points per question)
Circle the letter of the choice that best completes the statement or answers the question. If you need to change your answer, cross out your previous answer very clearly, and circle and put an arrow identifying the correct answer. If the distinction between your old and new answers is not clear, no points will be awarded.

1. The assumption of completeness means that

   A) all preferences conditions are met.
   B) the consumer can rank all possible consumption bundles.
   C) the consumer can rank all affordable consumption bundles.
   D) more of a good is always better.

2. The principle that "more is better" results in indifference curves

   A) reflecting greater preferences the further they are from the origin.
   B) not intersecting.
   C) sloping down.
   D) Both A and B are true.

3. Scarcity is a consequence of

   A) the maximization assumption in consumer choice theory.
   B) the non-satiation assumption in consumer choice theory.
   C) the continuity assumption in consumer choice theory.
   D) the consistency assumption in consumer choice theory.

4. A price increase for a good with a downward sloping price-consumption path indicates that

   A) the share of income spent on the good rises.
   B) the share of income spent on the good falls.
   C) the share of income spent on the good is unchanged.
   D) the good is inferior.
   E) the good is normal.

5. A rightward shift of the supply curve will lead to a(n)

   A) excess supply at the old equilibrium price.
   B) increase in quantity demanded.
   C) decrease in equilibrium price.
   D) All of the above.

6. From the 1970s through the 1990s, the relative price of a college education has increased greatly. During the same time period, college enrolment has also increased. This evidence suggests that during this time period

   A) the demand curve for a college education has shifted leftward.
   B) the supply curve for a college education has shifted leftward.
   C) the supply curve for a college education has shifted rightward.
   D) the demand curve for a college education has shifted rightward.

7. If the demand curve for a good is linear, quantity demanded is 18 units per period at a price of $3 per unit, and the price elasticity of demand is one-third, then the new quantity demanded at a price of $6 will be

   A) 6.
   B) 12.
   C) 15.
   D) 30.

8. Suppose the demand function for a good is expressed as Q = 100 - 4p. If the good currently sells for $10, then the price elasticity of demand equals

   A) -1.5.
   B) -2.5.
   C) -4.
   D) -0.67.

9. A vertical supply curve exhibits

   A) a perfectly inelastic supply curve.
   B) a constant elasticity of supply.
   C) Both A and B are true.
   D) None of the above.

10. The change in consumers surplus equals equivalent variation when

    A) the substitution effect is negative.
    B) the good is a complement.
    C) the income effect is zero.
    D) the good is inferior.

11. For output levels where marginal product is less than average product

    A) marginal product is increasing.
    B) average product is increasing.
    C) total product is decreasing.
    D) average product is decreasing.

12. The “law of diminishing marginal returns” states that, if technology and the use of all other inputs are held fixed, then as the use of the variable input increases

    A) its marginal cost will eventually fall.
    B) its marginal product will eventually fall.
    C) its average variable cost will eventually fall.
    D) its average product will eventually fall.

13. In the short run, efficiency in production rules out the possibility that as labour increases

    A) marginal product will eventually fall.
    B) marginal product will eventually fall, and remain positive.
    C) marginal product will eventually fall, and equal zero.
    D) marginal product will eventually fall, and become negative.

14. The opportunity cost of an input is

A) its historical value.
B) its value in its most valuable alternative use.
C) its value in any alternative use.
D) its value for accounting purposes.

15. If two variable inputs are used in production, and the price of one of the inputs doubles, then

A) more of the other input will be used to produce the same level of output.
B) the cost of producing the same level of output will double.
C) one intercept and the slope of the isocost line will change.
D) the output expansion path will be linear.

16. If the wage rate is $10 per hour and average product is 5 units of output per worker, then average cost is

A) $50.
B) $15.
C) $2.
D) $0.50.

17. Decreasing returns to scale is associated with

A) a downward-sloping long-run average cost curve.
B) a constant long-run average cost curve.
C) an upward-sloping long-run average cost curve.
D) a "U-shaped" long-run average cost curve.

18. If input prices rise when an industry increases its output to meet an increase in demand, then the long-run supply curve for this industry is

A) upward sloping.
B) horizontal.
C) downward sloping.
D) “U-shaped”.

19. A market's structure is described by

A) the ease with which firms can enter and exit the market.
B) the ability of firms to differentiate their product.
C) the number of firms in the market.
D) All of the above.

20. If consumers view the output of any firm in a market to be identical to the output of any other firm in the market, the demand curve for the output of any given firm

A) will be identical to the market demand curve.
B) will be vertical.
C) will be horizontal.
D) cannot be determined from the information given.

21. Which of the following is not an assumption underlying the theory of perfect competition?

A) All market participants are price takers.
B) All market participants have perfect knowledge of all relevant economic and technological information.
C) The products of all sellers in the market are identical.
D) The preferences of all buyers in the market are identical.

22. The perfectly competitive model makes a lot of fairly unrealistic assumptions. Why do economics text books still talk a lot about this model?

A) Perfectly competitive markets maximize societal welfare.
B) Many markets are close to being perfectly competitive.
C) It is an important model to use as a benchmark to compare other markets structures to.
D) All of the above.

23. If a firm makes zero economic profit, then the firm

A) is indifferent between staying and exiting the industry.
B) is better of exiting the industry.
C) has no incentive to stay in the industry.
D) will shut down.

24. In the long run, profits will equal zero in a competitive market because of

A) constant returns to scale.
B) free entry and exit.
C) identical products being produced by all firms.
D) the availability of information.

25. A small business owner earns $60,000 in revenue annually. The explicit annual costs equal $40,000. The owner could work for someone else and earn $25,000 annually. The owner's business profit is _____ and the economic profit is _____.

A) $20,000, -$5,000
B) $45,000, -$5,000
C) $25,000, -$5,000
D) $20,000, $5,000

26. If marginal revenue equals marginal cost, the firm is maximizing profits as long as

A) marginal cost exceeds marginal revenue for greater levels of output.
B) the resulting profits are positive.
C) the average cost curve lies above the demand curve.
D) All of the above are required.

27. If a competitive firm maximizes short-run profits by producing some quantity of output, which of the following must be true at that level of output?

A) MR = MC.
B) p = MC.
C) $p \geq AVC$.
D) All of the above.

28. To maximize profits, a perfectly competitive firm will produce where price equals

A) average cost.
B) marginal cost.
C) average fixed cost.
D) average variable cost.

29. The supply curve for a perfectly competitive firm includes the rising portion of its marginal cost curve that lies above

A) average cost.
B) average fixed cost.
C) average variable cost.
D) zero price.

30. If a firm is currently in short-run equilibrium earning a profit, what impact will a lump-sum tax have on its production decision?

A) The firm will not change output but earn a lower profit.
B) The firm will decrease output to earn a higher profit.
C) The firm will not change output and earn a higher profit.
D) The firm will increase output but earn a lower profit.

31. Suppose $C = 10 + (0.1 \times q^2)$. If $p = 10$, the firm's profits will be

A) 240.
B) 260.
C) 250.
D) -10 because the firm will shut down.

32. Suppose that for each firm in the competitive market for potatoes, long-run average cost is minimized at 20¢ per pound when 500 pounds are grown. The demand for potatoes is $Q = 10{,}000/p$. If the long-run supply curve is horizontal, then how many firms will this industry sustain in the long run?

A) 50,000
B) 100
C) 0
D) There is not enough information to answer.

33. Producer surplus equals

A) profit plus fixed cost.
B) total revenue minus total variable cost.
C) total revenue minus the sum of all marginal costs.
D) All of the above.

34. Suppose the market supply curve is $Q = p - 5$. At a price of 10, producer surplus equals

A) 50.
B) 12.50.
C) 25.
D) 10.

35. A quota will reduce consumer welfare when

A) the quota is on a good with high income elasticity.
B) the quota is less than the amount purchased without the quota.
C) the quota is greater than the amount purchased without the quota.
D) Quotas always reduce consumer welfare.

36. The total welfare associated with a market that includes a government sales tax equals

A) consumer surplus plus producer surplus plus government tax revenue.
B) the government tax revenue.
C) consumer surplus plus producer surplus minus government tax revenue.
D) consumer surplus plus producer surplus.

37. If a market produces a level of output below the competitive equilibrium, then

A) consumer surplus might still be maximized.
B) social welfare might still be enhanced if a price ceiling keeps price below the competitive price.
C) social welfare is not maximized.
D) the actual price will be below the equilibrium price.

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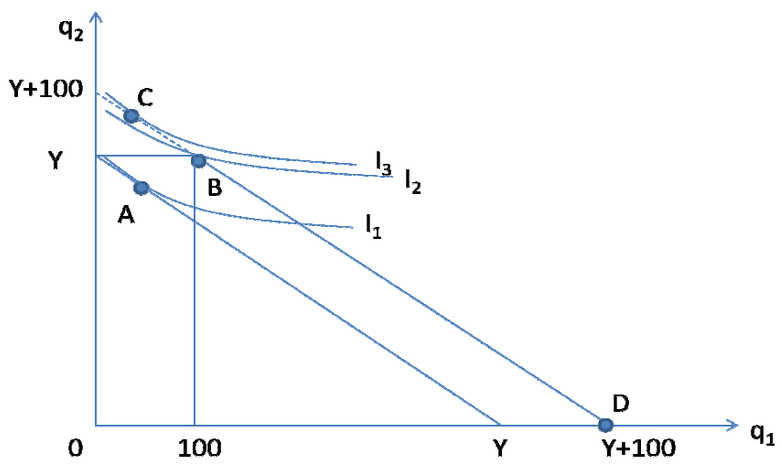
TRUE/FALSE. (20 points)
For the following, answer "True" or "False" and briefly explain why. Label and explain clearly any diagrams.

38. (6 points) If leisure is a normal good, the labour supply curve cannot be upward sloping.

False. If leisure is a normal good, then the income effect works to increase leisure when the wage rate increases, while the substitution effect works to decrease leisure. If the substitution effect dominates the income effect, leisure will fall and labour supply will rise, so that the labour supply curve will slope upwards. If the income effect dominates the substitution effect, leisure will rise and labour supply will fall, so that the labour supply curve will slope downwards. Typically, the labour supply curve will slope upwards when the wage rate is relatively low and the labour supply curve will slope downwards when the wage rate is relatively high.

39. (6 points) Assume that the price of a unit of food and the price of all other goods have been normalized to be $1 (this is done by choosing units of each of the two goods such that $1 buys 1 unit of each). A consumer who purchases 80 units of food each month will be worse off if given $100 in food stamps than if given a cash grant of $100.

True. Food stamps increase the opportunity set from YY to YB(Y+100). A cash grant increases the opportunity set by more to (Y+100)(Y+100). The consumer who purchases 80 units of food each month will initially be a point A. He/she will move to point B if given food stamps, but to point C if given an equivalent cash grant. Point C is associated with a higher level of utility. Food stamps limit this consumer's choices.



40. (4 points) In the case of a linear demand curve, demand becomes more price elastic as price increases.

True. For a demand curve of the form, $Q = a - bp$, elasticity can be written as

$\varepsilon = -b\left(\frac{p}{a-bp}\right)$.

As p increases, the term in brackets increases, making the elasticity increase.

41. (4 points) A competitive firm's supply curve is identical to its marginal cost curve.

False. The statement is only partly correct. The supply curve is only that portion that lies above AVC. To obtain the firm's supply curve, set $p = MC(q)$ and rearrange to find $q = q(p)$.

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SHORT ANSWER. (106 points)
Write your answer in the space provided. Show all your work. Label and explain clearly any diagrams.

42. (26 points) Suppose that a firm's production function is $q = 10KL$, where q is output per period, L is units of labour used per period, and K is units of capital used per period. Suppose also that the price of labour, w, is \$2 per unit and the price of capital, r, is \$6 per unit.

a) Does the production function display increasing, decreasing or constant returns to scale? Explain. (2 points)

Increasing returns to scale because either:
- doubling capital and labour will more than double output; or
- the sum of the exponents on capital and labour is greater than unity.

b) What is the shape of the firm's average cost curve? Explain. (3 points)

Increasing returns to scale is associated with a decreasing average cost curve.
- Doubling capital and labour will double cost, but more than double output so that $AC = \frac{C}{q}$ will fall.

c) If the firm wishes to minimize its costs of production, how much of each input should it use to produce 750 units of output? (6 points)

$q = 10KL \Rightarrow \frac{MP_L}{MP_K} = \frac{K}{L} = \frac{2}{6} = \frac{w}{r} \Rightarrow L = 3K$
$750 = 10KL \Rightarrow KL = 75 \Rightarrow 3K^2 = 75 \Rightarrow K = 5$ and $L = 15$

d) What is the minimum cost of producing 750 units of output? (2 points)

$C = wL + rK = 2(15) + 6(5) = 60$

e) What is the equation of the isocost line? (2 points)

$60 = 2L + 6K$ or $K = 10 - \frac{L}{3}$

f) If a change in tastes causes the firm to increase its output to 3000 units, what combination of inputs should the firm use? (4 points)

Since input prices have not changed, it is still the case that $L = 3K$.
However, now $3000 = 10KL \Rightarrow KL = 300 \Rightarrow 3K^2 = 300 \Rightarrow K = 10$ and $L = 30$.

g) Use a diagram to explain what the firm's output expansion path looks like. (5 points)

With L on the horizontal axis and K on the vertical axis, the output expansion path is a ray (a line from the origin) through points $(15,5)$ and $(30,10)$ with slope, $\frac{\Delta K}{\Delta L} = \frac{5}{15} = \frac{1}{3}$.

h) Would you characterize the inputs as normal or inferior? Explain. (2 points)

Both capital and labour are normal inputs because the use of each increases as output increases.

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43. (20 points) Suppose that a perfectly competitive firm's production function is $q = 2(KL)^{0.5}$, where q is output per period, L is units of labour used per period, and K is units of capital used per period. Suppose also that capital is fixed 25 units, the price of labour is \$2 per unit, the price of capital is \$4 per unit, and the price of output is \$6 per unit.

a) What is the equation of the short-run demand for labour? (2 points)

$q = 2(25L)^{0.5} \Rightarrow L(q) = \frac{q^2}{100}$

b) What is the equation of the variable cost function? (2 points)

$VC(q) = wL(q) = \frac{q^2}{50}$

c) What is the equation of the cost function? (2 points)

$C(q) = VC(q) + FC = \frac{q^2}{50} + 100$

d) What is the equation of the marginal cost function? (2 points)

$MC(q) = \frac{dC(q)}{dq} = \frac{q}{25}$

e) What is the equation of the average cost function? (2 points)

$AC(q) = \frac{C(q)}{q} = \frac{q}{50} + \frac{100}{q}$

f) What is the profit-maximizing level of output? (2 points)

$p = MC(q) \Rightarrow 6 = \frac{q}{25} \Rightarrow q = 150$

g) What is the firm's profit at the profit-maximizing level of output? (2 points)

$\pi = pq - C(q) = 900 - 550 = 350$

h) What is the cost-minimizing level of output? (3 points)

$MC(q) = AC(q) \Rightarrow \frac{q}{25} = \frac{q}{50} + \frac{100}{q} \Rightarrow q = 70.71$

i) How does the firm's profit at the cost-minimizing level of output compare to the firm's profit at the profit-maximizing level of output? (3 points)

$\pi(q = 70.71) = 6(70.71) - 200 = 424 - 200 = 224 < 350 = \pi(q = 150)$

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44. (25 points) Each of 10 firms in a competitive industry has the cost function, $C(q) = 25 + q^2$. The market demand function is $Q = 360 - p$.

a) Determine the equilibrium price, quantity per firm and market quantity. (8 points)

For each firm, profit maximization requires $p = MC(q) = 2q \Rightarrow q = \frac{p}{2}$.
Since there are 10 firms, the industry supply curve is $Q = 10q = 5p$.
Demand equals supply in equilibrium, so $360 - p = 5p \Rightarrow p = 60$.
Thus, $Q = 300$ and $q = 30$.

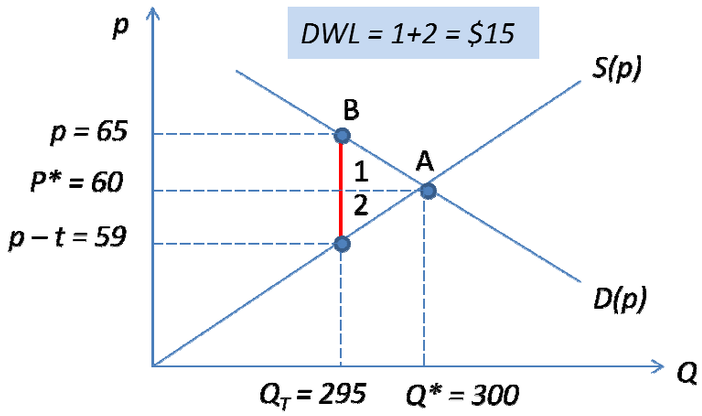
b) How does the imposition of a tax of $t = \$6$ per unit affect the equilibrium market price and quantity? What price do producers receive? (5 points)

Substituting the net of tax price in the supply curve yields $Q = 5(p - t) = 5p - 30$.
Demand equals supply in the equilibrium with the tax, so $360 - p = 5p - 30 \Rightarrow p = 65$.
Thus, $Q_T = 295$ and the price producers receive is $p - t = 59$.

c) Calculate the deadweight loss of the tax and use a diagram to illustrate your answer. (8 points)

$DWL = \frac{t}{2}(Q_T - Q) = -\frac{6}{2}(5) = -15$ (3 points)

(5 points for the diagram)



d) How is the burden of the tax shared between consumers and producers? (4 points)

The incidence of the tax falls most heavily on consumers who pay \$5 more per unit; they pay 83% of the tax. Producers receive \$1 less per unit; they pay 17% of the tax.

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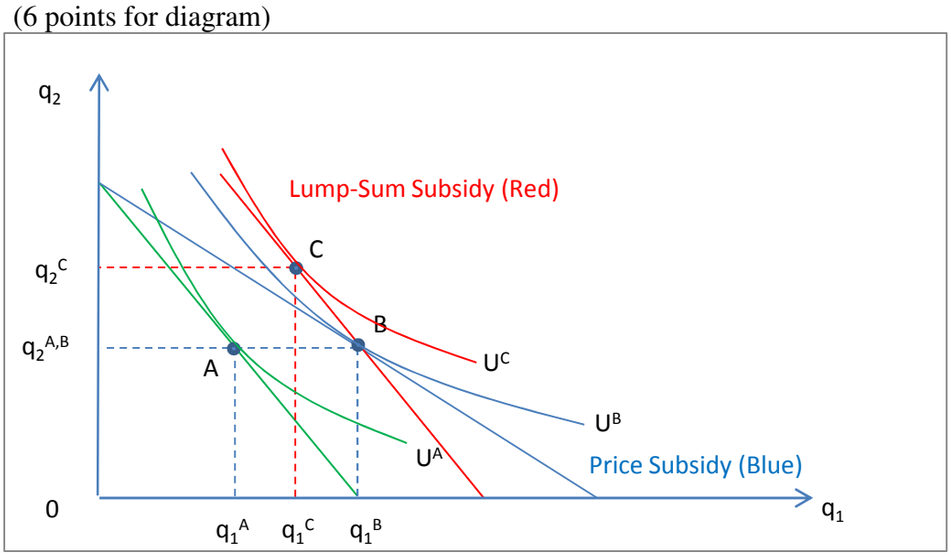
45. (15 points) The government is considering providing a $100 million subsidy for child care, but is unsure what form it should take. Using a diagram to explain your answer, how would taxpayers, consumers of child care services and child care providers each view a price subsidy versus a lump-sum subsidy for child care?

- Since the tax cost of the subsidy is the same in both cases, taxpayers would be indifferent between a price subsidy and a lump-sum subsidy. The diagram shows that the tax cost is the same since point B is attainable under either form of subsidy. (3 points)
- Since their utility would be higher with a lump-sum subsidy ($U^C > U^B$), the users of child care services would prefer the lump-sum subsidy. (3 points)
- Since the equilibrium quantity demanded of child care would be higher with a price subsidy ($q_1^B > q_1^C$), the child care industry would prefer the price subsidy. (3 points)

(6 points for diagram)



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46. (20 points) The demand functions associated with the utility function, $U(q_1, q_2) = q_1 q_2$, are $q_1 = \frac{Y}{2p_1}$ and $q_2 = \frac{Y}{2p_2}$.

a) What is the associated expenditure function? (5 points)

$U = q_1 q_2 = \frac{Y}{2p_1}\frac{Y}{2p_2} = \frac{Y^2}{4p_1 p_2} \Rightarrow e(p, U) = 2\sqrt{U p_1 p_2}$

b) If $Y = \$200$, $p_1 = \$4$ per unit, and $p_2 = \$5$ per unit, what is the consumer's level of utility? (3 points)

Since $q_1 = \frac{Y}{2p_1} = \frac{200}{2\times 4} = 25$ and $q_2 = \frac{Y}{2p_2} = \frac{200}{2\times 5} = 20$, $U^0 = 25 \times 20 = 500$.

c) If the price of good 1 increases to \$8 per unit, and income and the price of good 2 remain constant, what is the consumer's new level of utility? (3 points)

Since $q_1 = \frac{Y}{2p_1} = \frac{200}{2\times 8} = 12.5$ and $q_2 = 20$, $U^1 = 12.5 \times 20 = 250$.

d) Show that compensating variation associated with the increase in the price of good 1 is greater than the change in consumers surplus, and explain why. (9 points)

$CV = e(p^1, U^1) - e(p^1, U^0) = Y - e(p^1, U^0) = Y - 2\sqrt{U^0 p_1^1 p_2} \approx 200 - 283 = -83$

$\Delta CS = -\int_{p_1^0}^{p_1^1} q_1 dp_1 = -\frac{Y}{2}\int_{p_1^0}^{p_1^1} \frac{dp_1}{p_1} = -100(\ln 8 - \ln 4) \approx -69$

Thus, $|CV| = 83 > 69 = |\Delta CS|$.

This is always the case for a normal good. Good 1 is a normal good since $\frac{dq_1}{dY} = \frac{1}{2p_1} > 0$.