ECON 173 - Intermediate Microeconomic Analysis
Drake University, Fall 2013
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FINAL EXAMINATION ANSWER KEY

Version A

I. Multiple choice

(1)b.	(2)c.	(3)a.	(4)a.	(5)c.	(6)b.	(7)c.	(8)a.	(9)b.	(10)c.
(11)b.	(12)c.	(13)b.	(14)d.	(15)g.	(16)b.	(17)e.	(18)b.	(19)b.	(20)c.

II. Short answer

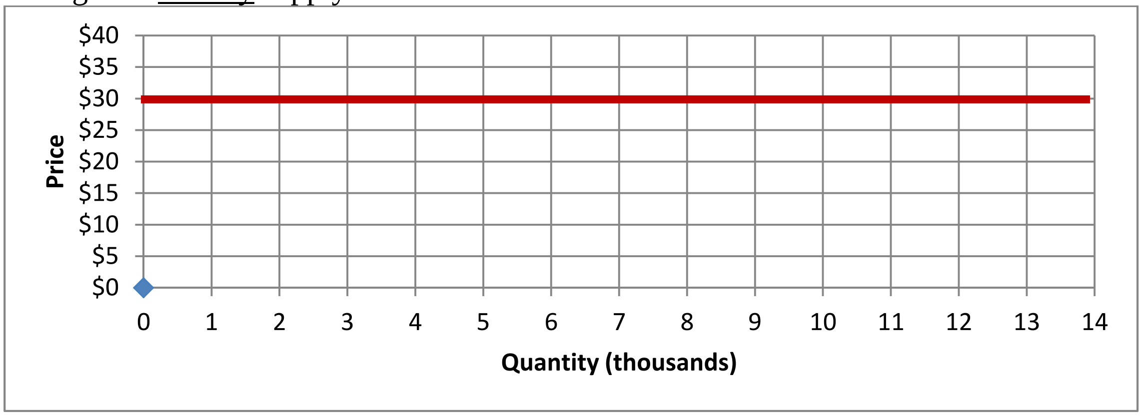
(1)	a. elastic	b. decrease	c. 6 percent
	d. decrease	e. 1 percent.	
(2)	a. 2 percent	b. 1.5 percent.	
(3)	a. \$0.95	b. decrease	c. \$0.05 .

III. Problems

(1) a. $100 = 4\ q_1 + 5\ q_2$ b. $MRS = (2\ q_1) / (3\ q_2)$ c. $q_1^* = 15$, $q_2^* = 8$.

(2) a. $MP_1 = 3\ x_1^{-3/4}\ x_2^{3/4}$. Yes, there are diminishing returns to input 1, because as x_1 increases (and x_2 is held constant) MP_1 diminishes.
b. $MRS = MP_2 / MP_1 = (3\ x_1\ ) / x_2$. Yes, production shows diminishing marginal rate of substitution, because as x_1 decreases and x_2 increases, MRS diminishes.
c. $f(ax_1, ax_2) = 12\ (ax_1)^{1/4}\ (ax_2)^{3/4} = a^{1/4}\ a^{3/4}\ 12\ x_1^{1/4}\ x_2^{3/4} = a\ q$. So this production function has *constant returns to scale.*

(3) a. $AC = TC/q = q^2 - 40q + 430$. Set $0 = dAC/dq = 2q - 40$ and solve to get $q_{ES} = 20$.
b. Breakeven price = minimum AC = $AC(q_{ES})$ = \$30.
c. Firm's supply curve is as follows.
If $P>\$30$, $P = MC(q) = dTC/dq = 3q^2 - 80q + 430$.
If $P<\$30$, $q=0$ (firm shuts down).
d. Long-run industry supply curve is a horizontal line at minimum AC:



(4) a. Rev = P × Q = 50Q – (Q^2/100), so MR = dRev/dQ = 50 – Q/50. Set MR = MC = 10 and solve to get **Q = 2000**. Insert into demand equation to get P = 50 – (2000/100) = **$30.**
b. Rev = P × Q = $30 × 2000 = $60,000. Production cost = $10 × 2000 = $20,000. Difference = maximum amount of up-front costs the company would pay for developing and patenting the chip = **$40,000.**
c. Under competition, P = MC = **$10**. Substituting into demand equation
$10 = 50 – Q/100, so Q = **4000.**
d. DWL = area of triangle = ½ × $20 × 2000 = **$20,000**.

(5) This game resembles a "Prisoners' Dilemma" game in that there are three Pareto-optimal outcomes, but the dominant-strategy equilibrium is not one of them.
a. There are three Pareto-optimal outcomes of this game:
1. Firm A advertises, Firm B does not advertise.
2. Firm A does not advertise, Firm B advertises.
3. Neither firm advertises
b. Each firm's dominant strategy is to advertise, so the dominant-strategy equilibrium is
1. Both firms advertise.
c. The only Nash equilibrium is the dominant-strategy equilibrium:
1. Both firms advertise.

(6) a. Set $P_D = P_S$ and solve to get Q** = 800 and P** = $P_D = P_S$ = $8.
b. MSB = MEB + P_D = 24 – (3Q)/200.
c. Set MSB = P_S and solve to get Q* = 1000.
d. Pigou subsidy rate that "internalizes the externality" = MEB(Q*) = $3.

(7) a. EW = 0.50 (300) + 0.50 (150) = $225.
b. EU = 0.50 (-300/300) + 0.50 (-300/150) = -1.5 utils.
c. Set -1.5 = (-300/W*) and solve to bet W* = $200.
d. Maximum premium willing to pay = initial wealth - W* = 300 – 200 = $100.
e. Actuarially fair premium = 0.50 (150) = $75.

(8) a. Demand for insurance = expected loss + $60, that is, P_D = 560 + 0.2 Q.
b. Marginal cost = expected loss for Qth person, that is, MC = EL = 500 – 0.2 Q.
c. Demand > MC for all Q, that is, everyone is willing to pay their marginal cost of insurance, so efficiency implies that everyone be insured: Q* = 1000.
d. AC = same intercept and half the slope of MC, if MC is linear.
So here, AC = 500 – 0.1 Q .
e. Set AC = P_D and solve to get Q** = 600 and P = $440.

IV. Critical thinking

Economic theory does **not necessarily** imply that competition will drive the market price down to marginal cost. That result depends on one's assumptions. If one assumes that all firms produce perfect substitutes and firms engage in **price competition**, then indeed the market price will be driven down to marginal cost. But if one assumes that firms take each others' **quantities** as given, instead of prices, as in a **Cournot oligopoly**, then price will **not** be driven down to marginal cost. Alternatively, if one assumes the firms' products are **differentiated** (imperfect substitutes in the eyes of consumers) and even if entry is free as in **monopolistic competition**, then price may be driven down to average cost, but will remain **above marginal cost** even in long-run equilibrium.

Version B

I. Multiple choice

(1)e.	(2)d.	(3)d.	(4)e.	(5)b.	(6)c.	(7)c.	(8)d.	(9)a.	(10)b.
(11)d.	(12)c.	(13)c.	(14)c.	(15)c.	(16)e.	(17)c.	(18)d.	(19)e.	(20)a.

II. Short answer

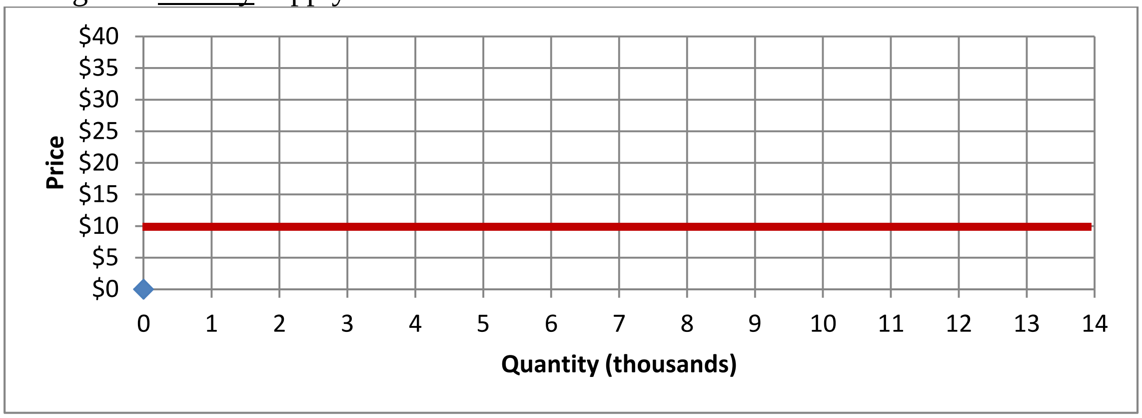
(1)	a. inelastic	b. decrease	c. 3 percent
	d. increase	e. 2 percent.	
(2)	a. 1.8 percent	b. 2.2 percent.	
(3)	a. $1.95	b. increase	c. $0.95 .

III. Problems

(1) a. $100 = 2\, q_1 + 5\, q_2$ b. MRS = $(4\, q_1) / q_2$ c. $q_1^* = 10$, $q_2^* = 16$.

(2) a. $MP_1 = 6\, x_1^{-2/4}\, x_2^{3/4}$. Yes, there are diminishing returns to input 1, because as x_1 increases (and x_2 is held constant) MP_1 diminishes.
b. $MRS = MP_2 / MP_1 = (3\, x_1) / (2\, x_2)$. Yes, production shows diminishing marginal rate of substitution, because as x_1 decreases and x_2 increases, MRS diminishes.
c. $f(ax_1, ax_2) = 12\, (ax_1)^{2/4}\, (ax_2)^{3/4} = a^{2/4}\, a^{3/4}\, 12\, x_1^{2/4}\, x_2^{3/4} > a^{5/4}\, q$. So this production function has *increasing returns to scale.*

(3) a. $AC = TC/q = q^2 - 100q + 2510$. Set $0 = dAC/dq = 2q - 100$ and solve to get $q_{ES} = 50$.
b. Breakeven price = minimum AC = $AC(q_{ES})$ = $10.
c. Firm's supply curve is as follows.
If P>$10, $P = MC(q) = dTC/dq = 3q^2 - 200q + 2510$.
If P<$10, q=0 (firm shuts down).
d. Long-run industry supply curve is a horizontal line at minimum AC:



(4) a. Rev = P × Q = 25Q – (Q^2/50), so MR = dRev/dQ = 25 – Q/25. Set MR = MC = 5 and solve to get **Q = 500**. Insert into demand equation to get P = 25 – (500/50) = **$15.**
b. Rev = P × Q = $15 × 500 = $7500. Production cost = $5 × 500 = $2500. Difference = maximum amount of up-front costs the company would pay for developing and patenting the chip = **$5000.**
c. Under competition, P = MC = **$5**. Substituting into demand equation
$10 = 25 – Q/50, so Q = **1000.**
d. DWL = area of triangle = ½ × $20 × 2000 = **$2500**.

(5) This game resembles a "Battle of the Sexes" game in that there are two Pareto-optimal outcomes which are also Nash equilibria.
a. There are two Pareto-optimal outcomes of this game:
1. Retailer A locates uptown, Retailer B locates downtown.
2. Retailer A locates downtown, Retailer B locates uptown.
b. Neither player has a dominant strategy, so there are **no** dominant-strategy equilibria.
c. There are two Nash equilibria:
1. Retailer A locates uptown, Retailer B locates downtown.
2. Retailer A locates downtown, Retailer B locates uptown.

(6) a. Set $P_D = P_S$ and solve to get Q** = 500 and P** = $P_D = P_S$ = $7.
b. MSC = MEC + P_S = 3 + (2Q)/100.
c. Set MSC = P_D and solve to get Q* = 300.
d. Pigou tax rate that "internalizes the externality" = MEC(Q*) = $4.

(7) a. EW = 0.50 (60) + 0.50 (30) = $45.
b. EU = 0.50 (-120/60) + 0.50 (-120/30) = -3 utils.
c. Set -3 = (-120/W*) and solve to bet W* = $40.
d. Maximum premium willing to pay = initial wealth - W* = 60 – 40 = $20.
e. Actuarially fair premium = 0.50 (30) = $15.

(8) a. Demand for insurance = expected loss + $20, that is, P_D = 220 + 0.1 Q.
b. Marginal cost = expected loss for Qth person, that is, MC = EL = 200 – 0.1 Q.
c. Demand > MC for all Q, that is, everyone is willing to pay their marginal cost of insurance, so efficiency implies that everyone be insured: Q* = 1000.
d. AC = same intercept and half the slope of MC, if MC is linear.
So here, AC = 200 – 0.05 Q .
e. Set AC = P_D and solve to get Q** = 400 and P = $180.

IV. Critical thinking

Same as Version A.

[end of answer key]