ECON 173 - Intermediate Microeconomic Analysis
Drake University, Fall 2017
William M. Boal

FINAL EXAMINATION ANSWER KEY

Version A

I. Multiple choice

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

II. Short answer

(1) a. necessary good. b. increase. c. 4%.
d. decrease. e. 1%.

(2) a. -0.25. b. decrease. c. 3%.
d. 0.5%. e. 2.5%.

(3) a. 80 thousand. b. excess supply. c. 60 thousand.
d. increase. e. $150 thousand. f. decrease.
g. $180 thousand. h. $30 thousand.

(4) a. $6. b. $4.50.

(5) a. ½ = 0.5. b. 1/10 = 0.1 c. zero.

(6) a. no, yes, yes, yes. b. yes, no, no, no. c. yes, no, no, no.

III. Problems

(1) [Finding individual demand functions]

a. MRS = $MU_2/MU_1 = q_1 / (4q_2)$.

Solve MRS = p_2/p_1 jointly with $I = p_1q_1 + p_2q_2$ to get

b. $q_1^* = \frac{4\,I}{5\,p_1}$, and c. $q_2^* = \frac{I}{5\,p_2}$.

(2) [Production functions]

a. $MP_1 = x_1^{-1/2}$. YES, there are diminishing returns to input 1, because as x_1 increases (and x_2 is held constant), MP_1 decreases.

b. $MRSP = MP_2/MP_1 = \frac{2\,x_1^{0.8}x_2^{-0.6}}{4\,x_1^{-0.2}x_2^{0.4}} = \frac{2\,x_1^{1/2}}{x_2^{1/2}}$. YES, this function has diminishing MRSP, because as x_1 decreases and x_2 increases, MRSP diminishes.

c. Check returns to scale:

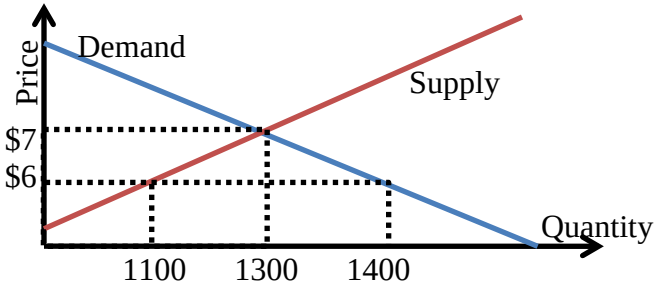
$f(ax_1, ax_2) = 2\,(ax_1)^{1/2} + 4(ax_2)^{1/2} = 2\,a^{1/2}\,x_1^{1/2} + 4\,a^{1/2}\,x_2^{1/2}$,

$= a^{1/2}\left(2\,x_1^{1/2} + 4\,x_2^{1/2}\right) = a^{1/2}\,q < a\,q$, for a>1.

So this production function has DECREASING returns to scale.

(3) [Short-run profit maximization and supply]
a. Set P = MC and solve for q: $5 = 0.5\,q + 1$, or $q^* = 8$.
b. Profit = TR – TC = ($5×8) – [SVC(8) +4] = $40 – 28 = $12.
c. Breakeven price = minimum SATC. So first find SATC:
$SATC = (SVC + SFC)/q = (0.25\,q^2 + q + 4) / q = 0.25\,q + 1 + (4/q)$.
Then set $dSATC/dq = 0$: $0.25 – (4/q^2) = 0$, which yields $q=4$.
Finally substitute: $SATC(4) = 0.25(4) + 1 + (4/4) = \$3$.

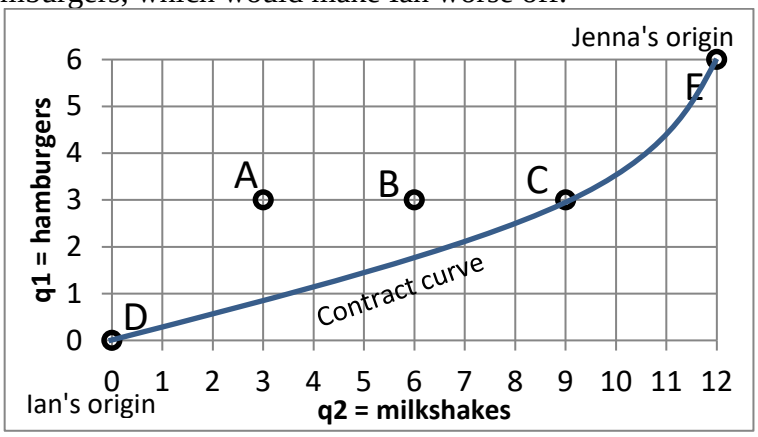
(4) [Welfare effects of international trade]
a. Set $Q_D = Q_S$ and solve to get $P^* = \$7$ and $Q^* = 1300$.
b. At $P = \$6$, $Q_D = 1400$ and $Q_S = 1100$. So the country will <u>import 300 units</u>.



c. Consumer surplus increases by $1350, the area of the larger trapezoid.
d. Producer surplus decreases by $1200, the area of the smaller trapezoid.
e. The country as a whole gains $1350 - $1200 = $150.

(5) [Exchange efficiency] Note that Ian's $MRS_I = q_1 / (3q_2)$ and Jenna's $MRS_J = q_1 / q_2$.
b. **No**, A is not Pareto-efficient, because $MRS_I = 2 \neq MRS_J = 2/9$.
c. **No,** B is not Pareto-efficient, because $MRS_I = 1 \neq MRS_J = 1/3$.
a. **Yes**, C is Pareto-efficient, because $MRS_I = 2/3 = MRS_J$.
d. **Yes,** D is Pareto-efficient, because no one can be made better off without someone else being made worse off. Jenna has everything, so she cannot be made better off. Ian has nothing, so he cannot be made better off without taking some of Jenna's milkshakes or hamburgers, which would make Jenna worse off.
e. **Yes,** E is Pareto-efficient, because no one can be made better off without someone else being made worse off. Ian has everything, so he cannot be made better off. Jenna has nothing, so she cannot be made better off without taking some of Ian's milkshakes or hamburgers, which would make Ian worse off.

f.



(6) [External cost and Pigou tax]
a. Set $P_D = P_S$ and solve to get Q** = 800, P = \$12.
b. MSC = P_S + MEC = 5 + (2Q/100).
c. Set MSC = P_D and solve to get Q* = 500.
d. DWL = (1/2) × (800-500) × (21-12) = \$1350.
e. Pigou tax rate = MEC(500) = \$6.

(7) [Uncertainty, risk aversion, demand for insurance.]
[This question assumes ridiculously small dollar values to make calculations easier.]
a. E(I) = (0.5 × 40) + (0.5 × 10) = \$25 .
b. E(U) = 0.5 × (10-(80/40)) + 0.5 × (10-(80/10)) = 5 utils.
c. Set U(I) = 10 – (80/I) = 5 and solve to get I* = \$16 .
d. Willing to pay \$40 - \$16 = \$24.
e. 0.50 × \$30 = \$15 .

(8) [Hidden characteristics and adverse selection]
a. P_D = 20 + EL = 220 – 0.1 Q.
b. MC = EL = 200 – 0.1 Q.
c. If the market were efficient, everyone (Q=1000) would get insurance because everyone is willing to pay more than the marginal cost of insurance: P_D > MC for all values of Q.
d. AC = 200 – 0.05 Q.
e. Set P_D = AC and solve to get Q = 400. P = AC = \$180.

IV. Essay

A good answer should first give an example of market failure that we have studied, such as monopoly, collusion, Cournot oligopoly, external costs, external benefits, or adverse selection. Using a graph, the difference between the socially-optimal quantity and the actual market quantity should be explained. The area of deadweight loss, which quantifies the decrease in economic efficiency, should be indicated on the graph.

Then the answer should give an example of government failure that we have studied, such as a tax, a subsidy, a price ceiling or price floor, a quota, or a ban on international trade. Again, using a graph, the difference between the socially-optimal quantity and the actual quantity under government intervention should be explained. The area of deadweight loss, which quantifies the decrease in economic efficiency, should be indicated on the graph.

For full credit, both graphs must be accurate and intelligible. In particular, axes and curves should be labeled, and efficient and actual outcome quantities should be indicated.

Version B

I. Multiple choice

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

II. Short answer

(1) a. luxury or superior good. b. increase. c. 7%.
d. increase. e. 2%.

(2) a. -1.3. b. increase. c. 14%.
d. 1%. e. 13%.
(3) a. 80 thousand. b. excess demand. c. 30 thousand.
d. decrease. e. \$90 thousand. f. increase.
g. \$60 thousand. h. \$30 thousand.
(4) a. \$10. b. \$6.
(5) a. ¼ = 0.25. b. 1/20 = 0.05 c. zero.
(6) a. no, yes, no, yes. b. no, no, no, no. c. no, no, no, yes.

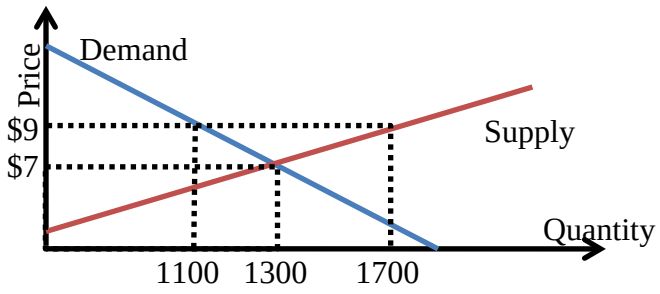
III. Problems

(1) [Finding individual demand functions]
a. MRS = $MU_2/MU_1 = (3q_1) / q_2$.
Solve MRS = p_2/p_1 jointly with $I = p_1q_1 + p_2q_2$ to get
b. $q_1^* = \frac{4I}{4\,p_1}$, and c. $q_2^* = \frac{3I}{4\,p_2}$.

(2) [Production functions]
a. $MP_1 = 5$. NO, there are no diminishing returns to input 1, because as x_1 increases (and x_2 is held constant), MP_1 remains constant.
b. $MRSP = MP_2/MP_1 = \frac{10}{5} = 2$. NO, this function does not have diminishing MRSP, because as x_1 decreases and x_2 increases, MRSP remains constant.
c. Check returns to scale:
$f(ax_1, ax_2) = 5\,(ax_1) \;\; + 10(ax_2) \;\; = a\,(5x_1 + 10x_2) = aq$.
So this production function has CONSTANT returns to scale.

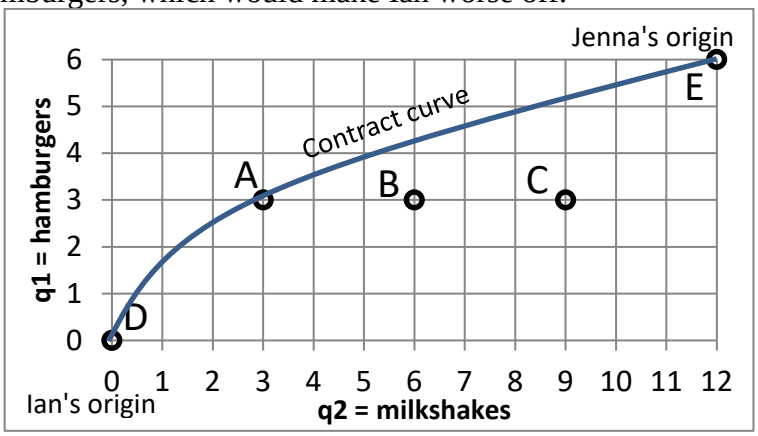
(3) [Short-run profit maximization and supply]
a. Set P = MC and solve for q: 11 = q+1, or q* = 10.
b. Profit = TR – TC = (\$11×10) – [SVC(10) +8] = \$110 – 68 = \$42.
c. Breakeven price = minimum SATC. So first find SATC:
SATC = (SVC + SFC)/q = $(0.5\,q^2 + q + 8) / q = 0.5\,q + 1 + (8/q)$.
Then set dSATC/dq = 0: $0.5 – (8/q^2) = 0$, which yields q=4.
Finally substitute: SATC(4) = 0.5(4) + 1 + (8/4) = \$5.

(4) [Welfare effects of international trade]
a. Set $Q_D = Q_S$ and solve to get P* = \$7 and Q* = 1300.
b. At P = \$9, Q_D = 1100 and Q_S = 1700. So the country will <u>export 600 units</u>.



c. Consumer surplus decreases by \$2400, the area of the smaller trapezoid.
d. Producer surplus increases by \$3000, the area of the larger trapezoid.
e. The country as a whole gains \$3000 - \$2400 = \$600.

(5) [Exchange efficiency] Note that Ian's $MRS_I = q_1 / (3q_2)$ and Jenna's $MRS_J = q_1 / q_2$.
a. **Yes**, A is Pareto-efficient, because $MRS_I = 1/3 = MRS_J$.
b. **No**, B is not Pareto-efficient, because $MRS_I = 1/6 \neq MRS_J = 1/2$.
c. **No,** C is not Pareto-efficient, because $MRS_I = 1/9 \neq MRS_J = 1$.
d. **Yes,** D is Pareto-efficient, because no one can be made better off without someone else being made worse off. Jenna has everything, so she cannot be made better off. Ian has nothing, so he cannot be made better off without taking some of Jenna's milkshakes or hamburgers, which would make Jenna worse off.
e. **Yes,** E is Pareto-efficient, because no one can be made better off without someone else being made worse off. Ian has everything, so he cannot be made better off. Jenna has nothing, so she cannot be made better off without taking some of Ian's milkshakes or hamburgers, which would make Ian worse off.
f.



(6) [External benefit and Pigou subsidy]
a. Set $P_D = P_S$ and solve to get Q** = 800, P = \$6.
b. $MSB = P_D + MEB = 22 – (3Q/200)$.
c. Set $MSB = P_S$ and solve to get Q* = 1000.
d. DWL = (1/2) × (1000-800) × (10-6) = \$400.
e. Pigou subsidy rate = MEB(1000) = \$3.

(7) [Uncertainty, risk aversion, demand for insurance.]
[This question assumes ridiculously small dollar values to make calculations easier.]
a. E(I) = (0.5 × 200) + (0.5 × 50) = \$125 .
b. E(U) = 0.5 × (15-(400/200)) + 0.5 × (15-(400/50)) = 10 utils.
c. Set U(I) = 15 – (400/I) = 10 and solve to get I* = \$80 .
d. Willing to pay \$200 - \$80 = \$120.
e. 0.50 × \$150 = \$75 .

(8) [Hidden characteristics and adverse selection]
a. $P_D = 60 + EL = 560 – 0.2\ Q$.
b. $MC = EL = 500 – 0.2\ Q$.
c. If the market were efficient, everyone (Q=1000) would get insurance because everyone is willing to pay more than the marginal cost of insurance: $P_D > MC$ for all values of Q.
d. $AC = 500 – 0.1\ Q$.
e. Set $P_D = AC$ and solve to get Q = 600. P = AC = \$440.

IV. Critical thinking
Same as Version A.

[end of answer key]