ECON 203
Final on Producer Theory and Equilibrium

This exam will begin at 9:40 and end at 11:20

Be sure to show your work for all answers, even if the work is simple. *All numeric answers are integers.*

1. *(10 points)* Please read and sign the following statement:

   I promise that my answers to this test are based on my own work without reference to any notes, books, or the assistance of any other person during the test.

   Name and Surname: _
   Student ID: _
   Signature:

   _

2. *(14 points total)* About Pareto Efficiency.

   (a) *(3 points)* Define *Pareto Dominance* or (equivalently) *Pareto Improvement.*

   (b) *(3 points)* Define *Pareto Efficiency.*

   (c) *(4 points)* Explain why suicide bombings must be Pareto Efficient (though morally abhorrent.)

   (d) *(4 points)* Monopolies are illegal. Thus when a court case proves a firm is a monopolist the result is either the monopoly is broken up into smaller companies or taken over by the government. Explain why this is not a Pareto Improvement and how it could be made to be. (Note: Monopolies cause dead weight loss.)

3. *(34 points total)* Robison Crusoe is a poor, impoverished Imperialist. Being stranded on an island, he's too afraid to scout around nearby islands for help. Instead he exists consuming Boa Constrictors (B) and Coconuts (C). His preferences are $U(B, C) = BC^4$ and his production possibilities frontier is $C + \frac{1}{4}B^2 \leq 36$.

   (a) *(1 point)* Set up the Lagrangian of his utility maximization problem.

   (b) *(3 points)* Find the first order conditions.

   (c) *(8 points)* Solve for the optimal amount of Boa Constrictors and Coconuts to consume.

   Now Robinson Crusoe has realized there is a very advanced native society living on the island right next to him.

   (d) Being afraid that their vast technological superiority will put him at a disadvantage, he first decides he will only trade for Boa Constrictor meat and Coconuts. The price of Boa Constrictor meat is $p_b = 12$ and the price of Coconuts is $p_c = 4$.

      i. *(1 point)* Set up the Lagrangian objective function that should determine how much he will produce of Boa Constrictors and Coconuts.

      ii. *(3 points)* Find the first order conditions of this objective function.

iii. *(4 points)* Find the optimal amount of Boa Constrictor and Coconuts for him to produce.

iv. *(1 point)* Set up his utility maximization problem when he can trade his Boa Constrictor meat and Coconuts.

v. *(3 points)* Find the first order conditions.

vi. *(4 points)* Find the optimal amount of Boa Constrictor and Coconuts for him to consume.

vii. *(3 points)* How can we be certain Robinson Crusoe is better off with trade?

(e) *(4 points)* Explain to Robinson Crusoe why it would be better for him to also trade for other goods, rather than only Boa Constrictors and Coconuts.

4. *(27 points total)* The land of Riverun is a vast land with only one river running through it. In the supply of watermelons, there are only 12 firms that can locate by the river. These firms (type r) have an economic cost of $C_r(q) = 8 + 2q^2$, the fixed sunk cost are $F_{su} = 6$. There are an unlimited number of other firms who have to pipe water from the river to their farms. These firms (type o) have a cost of $C_o(q) = 16 + 4q^2$ and their fixed start up costs are zero.

   (a) *(5 points)* Find the short run supply curve of the type r firms, with costs $C_r(q)$.

   (b) *(5 points)* Find the short run supply curve of the type o firms, with costs $C_o(q)$.

   (c) *(4 points)* If there are $n_o = 72$ type o firms, what will the industry short run supply curve be?

   (d) *(4 points)* Assuming that at least one type o firm produces, what will the long run price be in this market?

(e) *(3 points)* What will the profit of type r firms be? Explain the peculiar result you have just found.

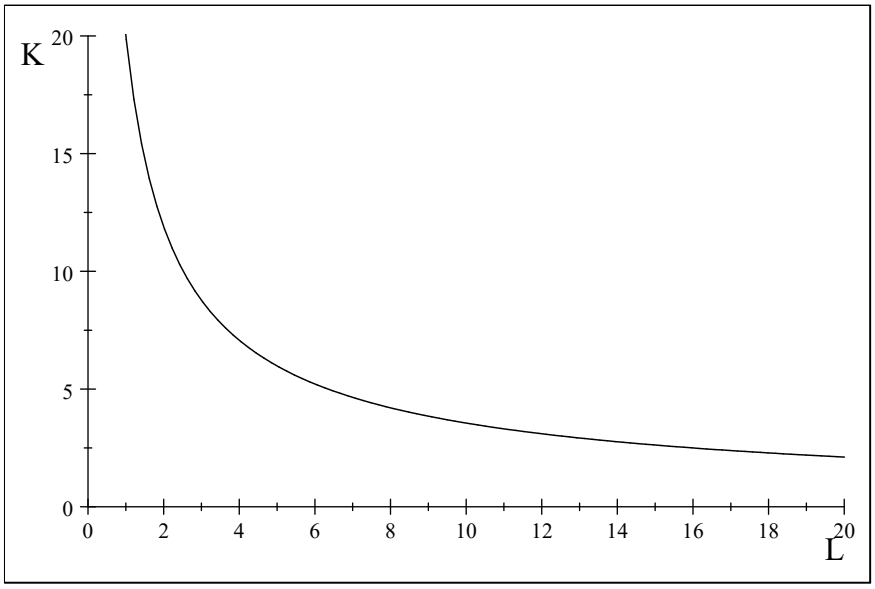
(f) *(4 points)* Now this country decides to import watermelons, the cost function of firms outside of Riverun is $C_r(q)$ and there are no transportation costs. What will be the long run price of watermelons in this case? (There is an unlimited number of foreign firms.)

(g) *(2 points)* Explain why even firms of type o might object to the importing of watermelons.

5. *(15 points total)* In this question you will prove that the cost function—$c(w, r, Q)$—is non-decreasing in input prices.

   (a) *(10 points)* Using only algebra and the definition of cost minimization, show that if $w \geq \tilde{w}$ and $r \geq \tilde{r}$ then $c(w, r, Q) \geq c(\tilde{w}, \tilde{r}, Q)$.

(b) *(5 points)* If r is held constant, show that if $w > \tilde{w}$ then $c(w, r, Q) \geq c(\tilde{w}, r, Q)$ using the following graph. The smooth curve is an isoquant.



ECON 203
Final on Producer Theory and Equilibrium

This exam will begin at 9:40 and end at 11:20

Be sure to show your work for all answers, even if the work is simple. *All numeric answers are integers.*

1. *(10 points)* Please read and sign the following statement:

   I promise that my answers to this test are based on my own work without reference to any notes, books, or the assistance of any other person during the test.

   Name and Surname: _
   Student ID: _
   Signature:

   _

2. *(14 points total)* About Pareto Efficiency.

   (a) *(3 points)* Define *Pareto Dominance* or (equivalently) *Pareto Improvement.*

   (b) *(3 points)* Define *Pareto Efficiency.*

   (c) *(4 points)* Explain why suicide bombings must be Pareto Efficient (though morally abhorrent.)

   (d) *(4 points)* Monopolies are illegal. Thus when a court case proves a firm is a monopolist the result is either the monopoly is broken up into smaller companies or taken over by the government. Explain why this is not a Pareto Improvement and how it could be made to be. (Note: Monopolies cause dead weight loss.)

3. *(34 points total)* Robison Crusoe is a poor, impoverished Imperialist. Being stranded on an island, he's too afraid to scout around nearby islands for help. Instead he exists consuming Boa Constrictors (B) and Coconuts (C). His preferences are $U(B, C) = BC^2$ and his production possibilities frontier is $C + \frac{1}{4}B^2 \leq 80$.

   (a) *(1 point)* Set up the Lagrangian of his utility maximization problem.

   (b) *(3 points)* Find the first order conditions.

   (c) *(8 points)* Solve for the optimal amount of Boa Constrictors and Coconuts to consume.

   Now Robinson Crusoe has realized there is a very advanced native society living on the island right next to him.

   (d) Being afraid that their vast technological superiority will put him at a disadvantage, he first decides he will only trade for Boa Constrictor meat and Coconuts. The price of Boa Constrictor meat is $p_b = 5$ and the price of Coconuts is $p_c = 1$.

      i. *(1 point)* Set up the Lagrangian objective function that should determine how much he will produce of Boa Constrictors and Coconuts.

      ii. *(3 points)* Find the first order conditions of this objective function.

iii. *(4 points)* Find the optimal amount of Boa Constrictor and Coconuts for him to produce.

iv. *(1 point)* Set up his utility maximization problem when he can trade his Boa Constrictor meat and Coconuts.

v. *(3 points)* Find the first order conditions.

vi. *(4 points)* Find the optimal amount of Boa Constrictor and Coconuts for him to consume.

vii. *(3 points)* How can we be certain Robinson Crusoe is better off with trade?

(e) *(4 points)* Explain to Robinson Crusoe why it would be better for him to also trade for other goods, rather than only Boa Constrictors and Coconuts.

4. *(27 points total)* The land of Riverun is a vast land with only one river running through it. In the supply of watermelons, there are only 16 firms that can locate by the river. These firms (type r) have an economic cost of $C_r(q) = 36 + 4q^2$, the fixed sunk cost are $F_{su} = 32$. There are an unlimited number of other firms who have to pipe water from the river to their farms. These firms (type o) have a cost of $C_o(q) = 32 + 8q^2$ and their fixed start up costs are zero.

   (a) *(5 points)* Find the short run supply curve of the type r firms, with costs $C_r(q)$.

   (b) *(5 points)* Find the short run supply curve of the type o firms, with costs $C_o(q)$.

   (c) *(4 points)* If there are $n_o = 80$ type o firms, what will the industry short run supply curve be?

   (d) *(4 points)* Assuming that at least one type o firm produces, what will the long run price be in this market?

(e) *(3 points)* What will the profit of type r firms be? Explain the peculiar result you have just found.

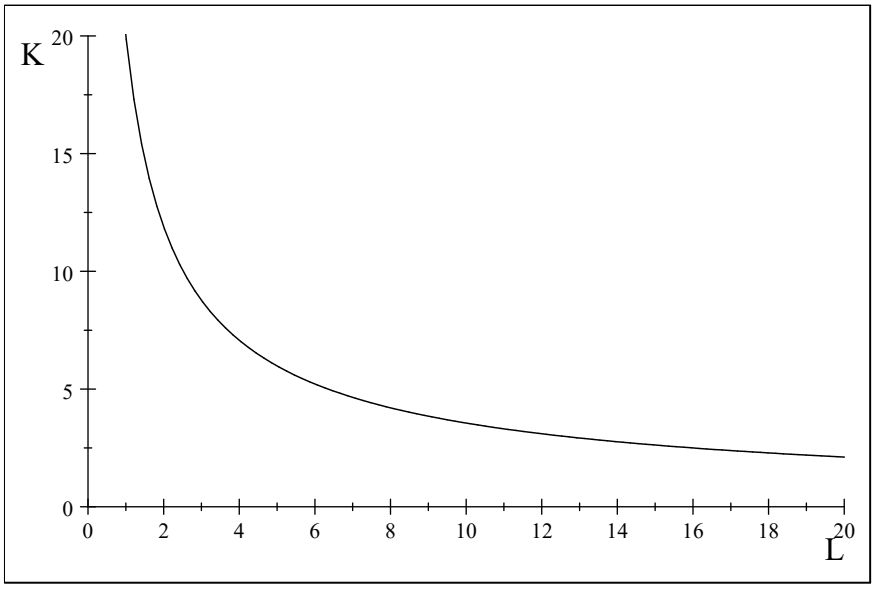
(f) *(4 points)* Now this country decides to import watermelons, the cost function of firms outside of Riverun is $C_r(q)$ and there are no transportation costs. What will be the long run price of watermelons in this case? (There is an unlimited number of foreign firms.)

(g) *(2 points)* Explain why even firms of type o might object to the importing of watermelons.

5. *(15 points total)* In this question you will prove that the cost function—$c(w, r, Q)$—is non-decreasing in input prices.

   (a) *(10 points)* Using only algebra and the definition of cost minimization, show that if $w \geq \tilde{w}$ and $r \geq \tilde{r}$ then $c(w, r, Q) \geq c(\tilde{w}, \tilde{r}, Q)$.

(b) *(5 points)* If r is held constant, show that if $w > \tilde{w}$ then $c(w, r, Q) \geq c(\tilde{w}, r, Q)$ using the following graph. The smooth curve is an isoquant.



ECON 203
Final on Producer Theory and Equilibrium

This exam will begin at 9:40 and end at 11:20

Be sure to show your work for all answers, even if the work is simple. *All numeric answers are integers.*

1. *(10 points)* Please read and sign the following statement:

   I promise that my answers to this test are based on my own work without reference to any notes, books, or the assistance of any other person during the test.

   Name and Surname: _
   Student ID: _
   Signature:

   _

2. *(14 points total)* About Pareto Efficiency.

   (a) *(3 points)* Define *Pareto Dominance* or (equivalently) *Pareto Improvement.*

   (b) *(3 points)* Define *Pareto Efficiency.*

   (c) *(4 points)* Explain why suicide bombings must be Pareto Efficient (though morally abhorrent.)

   (d) *(4 points)* Monopolies are illegal. Thus when a court case proves a firm is a monopolist the result is either the monopoly is broken up into smaller companies or taken over by the government. Explain why this is not a Pareto Improvement and how it could be made to be. (Note: Monopolies cause dead weight loss.)

3. *(34 points total)* Robison Crusoe is a poor, impoverished Imperialist. Being stranded on an island, he's too afraid to scout around nearby islands for help. Instead he exists consuming Boa Constrictors (B) and Coconuts (C). His preferences are $U(B, C) = BC^7$ and his production possibilities frontier is $C + B^2 \leq 135$.

   (a) *(1 point)* Set up the Lagrangian of his utility maximization problem.

   (b) *(3 points)* Find the first order conditions.

   (c) *(8 points)* Solve for the optimal amount of Boa Constrictors and Coconuts to consume.

   Now Robinson Crusoe has realized there is a very advanced native society living on the island right next to him.

   (d) Being afraid that their vast technological superiority will put him at a disadvantage, he first decides he will only trade for Boa Constrictor meat and Coconuts. The price of Boa Constrictor meat is $p_b = 10$ and the price of Coconuts is $p_c = 1$.

      i. *(1 point)* Set up the Lagrangian objective function that should determine how much he will produce of Boa Constrictors and Coconuts.

      ii. *(3 points)* Find the first order conditions of this objective function.

iii. *(4 points)* Find the optimal amount of Boa Constrictor and Coconuts for him to produce.

iv. *(1 point)* Set up his utility maximization problem when he can trade his Boa Constrictor meat and Coconuts.

v. *(3 points)* Find the first order conditions.

vi. *(4 points)* Find the optimal amount of Boa Constrictor and Coconuts for him to consume.

vii. *(3 points)* How can we be certain Robinson Crusoe is better off with trade?

(e) *(4 points)* Explain to Robinson Crusoe why it would be better for him to also trade for other goods, rather than only Boa Constrictors and Coconuts.

4. *(27 points total)* The land of Riverun is a vast land with only one river running through it. In the supply of watermelons, there are only 14 firms that can locate by the river. These firms (type r) have an economic cost of $C_r(q) = 9 + q^2$, the fixed sunk cost are $F_{su} = 5$. There are an unlimited number of other firms who have to pipe water from the river to their farms. These firms (type o) have a cost of $C_o(q) = 24 + \frac{3}{2}q^2$ and their fixed start up costs are zero.

   (a) *(5 points)* Find the short run supply curve of the type r firms, with costs $C_r(q)$.

   (b) *(5 points)* Find the short run supply curve of the type o firms, with costs $C_o(q)$.

   (c) *(4 points)* If there are $n_o = 60$ type o firms, what will the industry short run supply curve be?

   (d) *(4 points)* Assuming that at least one type o firm produces, what will the long run price be in this market?

(e) *(3 points)* What will the profit of type r firms be? Explain the peculiar result you have just found.

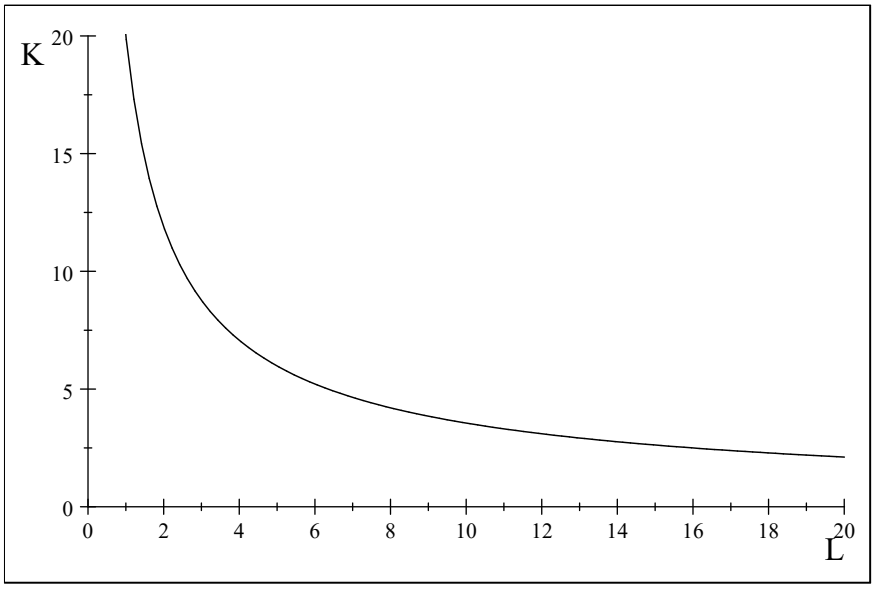
(f) *(4 points)* Now this country decides to import watermelons, the cost function of firms outside of Riverun is $C_r(q)$ and there are no transportation costs. What will be the long run price of watermelons in this case? (There is an unlimited number of foreign firms.)

(g) *(2 points)* Explain why even firms of type o might object to the importing of watermelons.

5. *(15 points total)* In this question you will prove that the cost function—$c(w, r, Q)$—is non-decreasing in input prices.

   (a) *(10 points)* Using only algebra and the definition of cost minimization, show that if $w \geq \tilde{w}$ and $r \geq \tilde{r}$ then $c(w, r, Q) \geq c(\tilde{w}, \tilde{r}, Q)$.

(b) *(5 points)* If r is held constant, show that if $w > \tilde{w}$ then $c(w, r, Q) \geq c(\tilde{w}, r, Q)$ using the following graph. The smooth curve is an isoquant.



ECON 203
Final on Producer Theory and Equilibrium

This exam will begin at 9:40 and end at 11:20

Be sure to show your work for all answers, even if the work is simple. *All numeric answers are integers.*

1. *(10 points)* Please read and sign the following statement:

   I promise that my answers to this test are based on my own work without reference to any notes, books, or the assistance of any other person during the test.

   Name and Surname: _
   Student ID: _
   Signature:

   _

2. *(14 points total)* About Pareto Efficiency.

   (a) *(3 points)* Define *Pareto Dominance* or (equivalently) *Pareto Improvement.*

   (b) *(3 points)* Define *Pareto Efficiency.*

   (c) *(4 points)* Explain why suicide bombings must be Pareto Efficient (though morally abhorrent.)

   (d) *(4 points)* Monopolies are illegal. Thus when a court case proves a firm is a monopolist the result is either the monopoly is broken up into smaller companies or taken over by the government. Explain why this is not a Pareto Improvement and how it could be made to be. (Note: Monopolies cause dead weight loss.)

3. *(34 points total)* Robison Crusoe is a poor, impoverished Imperialist. Being stranded on an island, he's too afraid to scout around nearby islands for help. Instead he exists consuming Boa Constrictors (B) and Coconuts (C). His preferences are $U(B,C) = BC^{\frac{5}{2}}$ and his production possibilities frontier is $C + \frac{1}{4}B^2 \leq 54$.

   (a) *(1 point)* Set up the Lagrangian of his utility maximization problem.

   (b) *(3 points)* Find the first order conditions.

   (c) *(8 points)* Solve for the optimal amount of Boa Constrictors and Coconuts to consume.

   Now Robinson Crusoe has realized there is a very advanced native society living on the island right next to him.

   (d) Being afraid that their vast technological superiority will put him at a disadvantage, he first decides he will only trade for Boa Constrictor meat and Coconuts. The price of Boa Constrictor meat is $p_b = 8$ and the price of Coconuts is $p_c = 2$.

      i. *(1 point)* Set up the Lagrangian objective function that should determine how much he will produce of Boa Constrictors and Coconuts.

      ii. *(3 points)* Find the first order conditions of this objective function.

iii. *(4 points)* Find the optimal amount of Boa Constrictor and Coconuts for him to produce.

iv. *(1 point)* Set up his utility maximization problem when he can trade his Boa Constrictor meat and Coconuts.

v. *(3 points)* Find the first order conditions.

vi. *(4 points)* Find the optimal amount of Boa Constrictor and Coconuts for him to consume.

vii. *(3 points)* How can we be certain Robinson Crusoe is better off with trade?

(e) *(4 points)* Explain to Robinson Crusoe why it would be better for him to also trade for other goods, rather than only Boa Constrictors and Coconuts.

4. *(27 points total)* The land of Riverun is a vast land with only one river running through it. In the supply of watermelons, there are only 18 firms that can locate by the river. These firms (type r) have an economic cost of $C_r(q) = 27 + 3q^2$, the fixed sunk cost are $F_{su} = 24$. There are an unlimited number of other firms who have to pipe water from the river to their farms. These firms (type o) have a cost of $C_o(q) = 16 + 9q^2$ and their fixed start up costs are zero.

   (a) *(5 points)* Find the short run supply curve of the type r firms, with costs $C_r(q)$.

   (b) *(5 points)* Find the short run supply curve of the type o firms, with costs $C_o(q)$.

   (c) *(4 points)* If there are $n_o = 72$ type o firms, what will the industry short run supply curve be?

   (d) *(4 points)* Assuming that at least one type o firm produces, what will the long run price be in this market?

(e) *(3 points)* What will the profit of type r firms be? Explain the peculiar result you have just found.

(f) *(4 points)* Now this country decides to import watermelons, the cost function of firms outside of Riverun is $C_r(q)$ and there are no transportation costs. What will be the long run price of watermelons in this case? (There is an unlimited number of foreign firms.)

(g) *(2 points)* Explain why even firms of type o might object to the importing of watermelons.

5. *(15 points total)* In this question you will prove that the cost function—$c(w, r, Q)$—is non-decreasing in input prices.

   (a) *(10 points)* Using only algebra and the definition of cost minimization, show that if $w \geq \tilde{w}$ and $r \geq \tilde{r}$ then $c(w, r, Q) \geq c(\tilde{w}, \tilde{r}, Q)$.

(b) *(5 points)* If r is held constant, show that if $w > \tilde{w}$ then $c(w, r, Q) \geq c(\tilde{w}, r, Q)$ using the following graph. The smooth curve is an isoquant.