ECON 203
Final

Be sure to show your work for all answers, even if the work is simple.

This exam will approximately begin at:

9:10 in A125, 9:15 in A127, 9:20 in A229, and 9:25 in A329

Students in the wrong room will loose at least 5 minutes from the time they have to complete the exam.

1. *(4 points)* **Honor Statement:** 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. I will also not use a calculator or other electronic aid for calculation.

   Name and Surname: _
   Student ID: _
   Signature:
   _

2. *(16 points total)* Robinson Crusoe is a stupid fellow, as we all know. Despite their being a large community on the next island over he produces everything himself and does not trade with them. Fortunately for him Friday (real name unknown because Robinson couldn't pronounce it) decides to hang out with him, and being absolutely brilliant (he has a Ph.D. in economics from a nearby university) he learns English and tries to convince Robinson he would be better off trading with the locals. Robinson has a series of arguments against trading, explain how each one is wrong using economics.

   (a) *(4 points)* Robinson Crusoe is a European and thus vastly more capable at producing everything than some uncivilized locals.

   (b) *(6 points)* Even if he was to trade with them, he has no idea how valuable each of the goods he produces is. (You may assume he produces only food and clothing for the purposes of your argument, however you must ask him questions he can answer.)

(c) *(6 points)* Finally, why would there be a benefit of trading anyway? How could it possibly make him better off than producing everything himself?

3. *(16 points total)* Consider an exchange economy, person a has the preferences $U_a(F_a, C_a) = F_a^{\frac{1}{3}} C_a^{1-\frac{1}{3}}$ and an initial endowment of food and clothing of $\left(F_a^0, C_a^0\right) = (2, 4)$. Person b has preferences $U_b(F_b, C_b) = F_b^{\frac{2}{3}} C_b^{1-\frac{2}{3}}$ and an initial endowment of $\left(F_b^0, C_b^0\right) = (5, 16)$.

   (a) *(6 points)* If a person has the preferences $u(x, y) = x^\alpha y^{1-\alpha}$ for $0 < \alpha < 1$ show that their demand for x given the budget set $px + qy \leq I$ is $x(p, q, I) = \alpha \frac{I}{p}$. You may use this below even if you cannot show it.

   (b) *(10 points)* Find the equilibrium prices of food and clothing (denoted p_f and p_c) and the final consumptions of food and clothing for both person a and person b. To be technical, find $(p_f, p_c, F_a^*, C_a^*, F_b^*, C_b^*)$ where Z_i^* is the equilibrium consumption of Z by person i.

4. *(23 points total)* In a given industry there are two competing technologies. Type a firms have a cost function of $c_a(q) = 4q + q^2 + 9$ with a fixed sunk cost of $F^a_{su} = 8$, there are currently 5 of them. Type b firms have a cost function of $c_b(q) = q + \frac{1}{4}q^2 + 11^2$, with a fixed start up cost of $F^b_{st} = 1$ and there are 8 of them. NOTE: $11^2 = 121$.

   (a) *(5 points)* For type a firms find the marginal cost, the average cost, the average variable cost, the price at which they will shut down (P^a_{sd}) and the price at which new firms will enter with this technology (P^a_{in}).

   (b) *(5 points)* For type b firms find the marginal cost, the average cost, the average variable cost, the price at which they will shut down (P^b_{sd}) and the price at which new firms will enter with this technology (P^b_{in}).

(c) *(2 points)* Assume that right now $P = 5$, how many firms of each type will produce?

(d) *(2 points)* If some firms enter, which type will they be and why?

(e) *(3 points)* In the long run what will be the **unique** equilibrium price? How many of each type of firm will there be?

(f) *(4 points)* Assume the government charges a per-unit tax of t, in the long run what will be the tax burden of the firms? Explain.

5. *(11 points total)* Let $c(q)$ be a cost function, $AVC(q) = \frac{c(q)-F_{su}}{q}$, and $MC(q) = \frac{dc(q)}{dq} > 0$. You may assume that $\frac{dMC(q)}{dq} \geq 0$.

   (a) *(4 points)* Show that if $\frac{dAVC(q)}{dq} \geq 0$ then $MC(q) \geq AVC(q)$.

   (b) *(3 points)* Further show that if q^{sd} minimizes average cost, then $MC\left(q^{sd}\right) = AVC\left(q^{sd}\right)$.

   (c) *(4 points)* We assume that if $P \geq MC\left(q^{sd}\right)$ then the firm will supply $q(P)$ which is defined as $P = MC(q(P))$, use what you showed above to show that the firms variable profit $(\pi + F_{su})$ will be greater than zero.

6. *(14 points total)* Assume we have a cost function $c(w, r, p_m, q)$ where $w > 0$ is the cost of a unit of labor, $r > 0$ is the opportunity cost of a unit of capital, $p_m > 0$ is the cost of a unit of materials and $q > 0$ is the amount of output produced.

   (a) *(8 points)* Prove that this function is non-decreasing in input prices, i.e. that $\frac{\partial c}{\partial w} \geq 0$, $\frac{\partial c}{\partial r} \geq 0$, and $\frac{\partial c}{\partial p_m} \geq 0$. You may use a graphic proof, but you will get at most a third of the credit unless you can explain how your proof generalizes.

   (b) *(3 points)* How do we know that $\frac{\partial c}{\partial w} = L(w, r, p_m, q)$ or the input demand for labor? Explain.

   (c) *(3 points)* How do we know that $\frac{\partial L(w,r,p_m,q)}{\partial w} \leq 0$ or an input demand is decreasing in its own price? Explain.

ECON 203
Final

Be sure to show your work for all answers, even if the work is simple.

This exam will approximately begin at:
9:10 in A125, 9:15 in A127, 9:20 in A229, and 9:25 in A329

Students in the wrong room will loose at least 5 minutes from the time they have to complete the exam.

1. *(4 points)* **Honor Statement:** 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. I will also not use a calculator or other electronic aid for calculation.

   Name and Surname: _
   Student ID: _
   Signature:

   _

2. *(16 points total)* Robinson Crusoe is a stupid fellow, as we all know. Despite their being a large community on the next island over he produces everything himself and does not trade with them. Fortunately for him Friday (real name unknown because Robinson couldn't pronounce it) decides to hang out with him, and being absolutely brilliant (he has a Ph.D. in economics from a nearby university) he learns English and tries to convince Robinson he would be better off trading with the locals. Robinson has a series of arguments against trading, explain how each one is wrong using economics.

   (a) *(4 points)* Robinson Crusoe is a European and thus vastly more capable at producing everything than some uncivilized locals.

   (b) *(6 points)* Even if he was to trade with them, he has no idea how valuable each of the goods he produces is. (You may assume he produces only food and clothing for the purposes of your argument, however you must ask him questions he can answer.)

(c) *(6 points)* Finally, why would there be a benefit of trading anyway? How could it possibly make him better off than producing everything himself?

3. *(16 points total)* Consider an exchange economy, person a has the preferences $U_a(F_a, C_a) = F_a^{\frac{1}{2}} C_a^{1-\frac{1}{2}}$ and an initial endowment of food and clothing of $\left(F_a^0, C_a^0\right) = (2, 7)$. Person b has preferences $U_b(F_b, C_b) = F_b^{\frac{1}{5}} C_b^{1-\frac{1}{5}}$ and an initial endowment of $\left(F_b^0, C_b^0\right) = (8, 1)$.

   (a) *(6 points)* If a person has the preferences $u(x, y) = x^\alpha y^{1-\alpha}$ for $0 < \alpha < 1$ show that their demand for x given the budget set $px + qy \leq I$ is $x(p, q, I) = \alpha \frac{I}{p}$. You may use this below even if you cannot show it.

   (b) *(10 points)* Find the equilibrium prices of food and clothing (denoted p_f and p_c) and the final consumptions of food and clothing for both person a and person b. To be technical, find $(p_f, p_c, F_a^*, C_a^*, F_b^*, C_b^*)$ where Z_i^* is the equilibrium consumption of Z by person i.

4. *(23 points total)* In a given industry there are two competing technologies. Type a firms have a cost function of $c_a(q) = 8q + q^2 + 16$ with a fixed sunk cost of $F^a_{su} = 7$, there are currently 9 of them. Type b firms have a cost function of $c_b(q) = 2q + q^2 + 25$, with a fixed start up cost of $F^b_{st} = 9$ and there are 6 of them.

   (a) *(5 points)* For type a firms find the marginal cost, the average cost, the average variable cost, the price at which they will shut down (P^a_{sd}) and the price at which new firms will enter with this technology (P^a_{in}).

   (b) *(5 points)* For type b firms find the marginal cost, the average cost, the average variable cost, the price at which they will shut down (P^b_{sd}) and the price at which new firms will enter with this technology (P^b_{in}).

(c) *(2 points)* Assume that right now $P = 7$, how many firms of each type will produce?

(d) *(2 points)* If some firms enter, which type will they be and why?

(e) *(3 points)* In the long run what will be the **unique** equilibrium price? How many of each type of firm will there be?

(f) *(4 points)* Assume the government charges a per-unit tax of t, in the long run what will be the tax burden of the firms? Explain.

5. *(11 points total)* Let $c(q)$ be a cost function, $AVC(q) = \frac{c(q)-F_{su}}{q}$, and $MC(q) = \frac{dc(q)}{dq} > 0$. You may assume that $\frac{dMC(q)}{dq} \geq 0$.

   (a) *(4 points)* Show that if $\frac{dAVC(q)}{dq} \geq 0$ then $MC(q) \geq AVC(q)$.

   (b) *(3 points)* Further show that if q^{sd} minimizes average cost, then $MC\left(q^{sd}\right) = AVC\left(q^{sd}\right)$.

   (c) *(4 points)* We assume that if $P \geq MC\left(q^{sd}\right)$ then the firm will supply $q(P)$ which is defined as $P = MC(q(P))$, use what you showed above to show that the firms variable profit $(\pi + F_{su})$ will be greater than zero.

6. *(14 points total)* Assume we have a cost function $c(w, r, p_m, q)$ where $w > 0$ is the cost of a unit of labor, $r > 0$ is the opportunity cost of a unit of capital, $p_m > 0$ is the cost of a unit of materials and $q > 0$ is the amount of output produced.

   (a) *(8 points)* Prove that this function is non-decreasing in input prices, i.e. that $\frac{\partial c}{\partial w} \geq 0$, $\frac{\partial c}{\partial r} \geq 0$, and $\frac{\partial c}{\partial p_m} \geq 0$. You may use a graphic proof, but you will get at most a third of the credit unless you can explain how your proof generalizes.

   (b) *(3 points)* How do we know that $\frac{\partial c}{\partial w} = L(w, r, p_m, q)$ or the input demand for labor? Explain.

   (c) *(3 points)* How do we know that $\frac{\partial L(w,r,p_m,q)}{\partial w} \leq 0$ or an input demand is decreasing in its own price? Explain.

ECON 203
Final

Be sure to show your work for all answers, even if the work is simple.

This exam will approximately begin at:
9:10 in A125, 9:15 in A127, 9:20 in A229, and 9:25 in A329

Students in the wrong room will loose at least 5 minutes from the time they have to complete the exam.

1. *(4 points)* **Honor Statement:** 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. I will also not use a calculator or other electronic aid for calculation.

   Name and Surname: _
   Student ID: _
   Signature:

   _

2. *(16 points total)* Robinson Crusoe is a stupid fellow, as we all know. Despite their being a large community on the next island over he produces everything himself and does not trade with them. Fortunately for him Friday (real name unknown because Robinson couldn't pronounce it) decides to hang out with him, and being absolutely brilliant (he has a Ph.D. in economics from a nearby university) he learns English and tries to convince Robinson he would be better off trading with the locals. Robinson has a series of arguments against trading, explain how each one is wrong using economics.

   (a) *(4 points)* Robinson Crusoe is a European and thus vastly more capable at producing everything than some uncivilized locals.

   (b) *(6 points)* Even if he was to trade with them, he has no idea how valuable each of the goods he produces is. (You may assume he produces only food and clothing for the purposes of your argument, however you must ask him questions he can answer.)

(c) *(6 points)* Finally, why would there be a benefit of trading anyway? How could it possibly make him better off than producing everything himself?

3. *(16 points total)* Consider an exchange economy, person a has the preferences $U_a(F_a, C_a) = F_a^{\frac{1}{2}} C_a^{1-\frac{1}{2}}$ and an initial endowment of food and clothing of $\left(F_a^0, C_a^0\right) = (6, 3)$. Person b has preferences $U_b(F_b, C_b) = F_b^{\frac{1}{3}} C_b^{1-\frac{1}{3}}$ and an initial endowment of $\left(F_b^0, C_b^0\right) = (7, 7)$.

   (a) *(6 points)* If a person has the preferences $u(x, y) = x^\alpha y^{1-\alpha}$ for $0 < \alpha < 1$ show that their demand for x given the budget set $px + qy \leq I$ is $x(p, q, I) = \alpha \frac{I}{p}$. You may use this below even if you cannot show it.

   (b) *(10 points)* Find the equilibrium prices of food and clothing (denoted p_f and p_c) and the final consumptions of food and clothing for both person a and person b. To be technical, find $(p_f, p_c, F_a^*, C_a^*, F_b^*, C_b^*)$ where Z_i^* is the equilibrium consumption of Z by person i.

4. *(23 points total)* In a given industry there are two competing technologies. Type a firms have a cost function of $c_a(q) = 4q + 4q^2 + 4$ with a fixed sunk cost of $F^a_{su} = 3$, there are currently 6 of them. Type b firms have a cost function of $c_b(q) = 2q + q^2 + 49$, with a fixed start up cost of $F^b_{st} = 1$ and there are 13 of them.

   (a) *(5 points)* For type a firms find the marginal cost, the average cost, the average variable cost, the price at which they will shut down (P^a_{sd}) and the price at which new firms will enter with this technology (P^a_{in}).

   (b) *(5 points)* For type b firms find the marginal cost, the average cost, the average variable cost, the price at which they will shut down (P^b_{sd}) and the price at which new firms will enter with this technology (P^b_{in}).

(c) *(2 points)* Assume that right now $P = 7$, how many firms of each type will produce?

(d) *(2 points)* If some firms enter, which type will they be and why?

(e) *(3 points)* In the long run what will be the **unique** equilibrium price? How many of each type of firm will there be?

(f) *(4 points)* Assume the government charges a per-unit tax of t, in the long run what will be the tax burden of the firms? Explain.

5. *(11 points total)* Let $c(q)$ be a cost function, $AVC(q) = \frac{c(q)-F_{su}}{q}$, and $MC(q) = \frac{dc(q)}{dq} > 0$. You may assume that $\frac{dMC(q)}{dq} \geq 0$.

   (a) *(4 points)* Show that if $\frac{dAVC(q)}{dq} \geq 0$ then $MC(q) \geq AVC(q)$.

   (b) *(3 points)* Further show that if q^{sd} minimizes average cost, then $MC\left(q^{sd}\right) = AVC\left(q^{sd}\right)$.

   (c) *(4 points)* We assume that if $P \geq MC\left(q^{sd}\right)$ then the firm will supply $q(P)$ which is defined as $P = MC(q(P))$, use what you showed above to show that the firms variable profit $(\pi + F_{su})$ will be greater than zero.

6. *(14 points total)* Assume we have a cost function $c(w, r, p_m, q)$ where $w > 0$ is the cost of a unit of labor, $r > 0$ is the opportunity cost of a unit of capital, $p_m > 0$ is the cost of a unit of materials and $q > 0$ is the amount of output produced.

   (a) *(8 points)* Prove that this function is non-decreasing in input prices, i.e. that $\frac{\partial c}{\partial w} \geq 0$, $\frac{\partial c}{\partial r} \geq 0$, and $\frac{\partial c}{\partial p_m} \geq 0$. You may use a graphic proof, but you will get at most a third of the credit unless you can explain how your proof generalizes.

   (b) *(3 points)* How do we know that $\frac{\partial c}{\partial w} = L(w, r, p_m, q)$ or the input demand for labor? Explain.

   (c) *(3 points)* How do we know that $\frac{\partial L(w,r,p_m,q)}{\partial w} \leq 0$ or an input demand is decreasing in its own price? Explain.

ECON 203
Final

Be sure to show your work for all answers, even if the work is simple.

This exam will approximately begin at:
9:10 in A125, 9:15 in A127, 9:20 in A229, and 9:25 in A329

Students in the wrong room will loose at least 5 minutes from the time they have to complete the exam.

1. *(4 points)* **Honor Statement:** 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. I will also not use a calculator or other electronic aid for calculation.

   Name and Surname: _
   Student ID: _
   Signature:

   _

2. *(16 points total)* Robinson Crusoe is a stupid fellow, as we all know. Despite their being a large community on the next island over he produces everything himself and does not trade with them. Fortunately for him Friday (real name unknown because Robinson couldn't pronounce it) decides to hang out with him, and being absolutely brilliant (he has a Ph.D. in economics from a nearby university) he learns English and tries to convince Robinson he would be better off trading with the locals. Robinson has a series of arguments against trading, explain how each one is wrong using economics.

   (a) *(4 points)* Robinson Crusoe is a European and thus vastly more capable at producing everything than some uncivilized locals.

   (b) *(6 points)* Even if he was to trade with them, he has no idea how valuable each of the goods he produces is. (You may assume he produces only food and clothing for the purposes of your argument, however you must ask him questions he can answer.)

(c) *(6 points)* Finally, why would there be a benefit of trading anyway? How could it possibly make him better off than producing everything himself?

3. *(16 points total)* Consider an exchange economy, person a has the preferences $U_a(F_a, C_a) = F_a^{\frac{1}{3}} C_a^{1-\frac{1}{3}}$ and an initial endowment of food and clothing of $\left(F_a^0, C_a^0\right) = (2, 8)$. Person b has preferences $U_b(F_b, C_b) = F_b^{\frac{1}{2}} C_b^{1-\frac{1}{2}}$ and an initial endowment of $\left(F_b^0, C_b^0\right) = (6, 12)$.

   (a) *(6 points)* If a person has the preferences $u(x, y) = x^\alpha y^{1-\alpha}$ for $0 < \alpha < 1$ show that their demand for x given the budget set $px + qy \leq I$ is $x(p, q, I) = \alpha \frac{I}{p}$. You may use this below even if you cannot show it.

   (b) *(10 points)* Find the equilibrium prices of food and clothing (denoted p_f and p_c) and the final consumptions of food and clothing for both person a and person b. To be technical, find $(p_f, p_c, F_a^*, C_a^*, F_b^*, C_b^*)$ where Z_i^* is the equilibrium consumption of Z by person i.

4. *(23 points total)* In a given industry there are two competing technologies. Type a firms have a cost function of $c_a(q) = 10q + q^2 + 16$ with a fixed sunk cost of $F^a_{su} = 15$, there are currently 12 of them. Type b firms have a cost function of $c_b(q) = 4q + q^2 + 25$, with a fixed start up cost of $F^b_{st} = 16$ and there are 14 of them.

   (a) *(5 points)* For type a firms find the marginal cost, the average cost, the average variable cost, the price at which they will shut down (P^a_{sd}) and the price at which new firms will enter with this technology (P^a_{in}).

   (b) *(5 points)* For type b firms find the marginal cost, the average cost, the average variable cost, the price at which they will shut down (P^b_{sd}) and the price at which new firms will enter with this technology (P^b_{in}).

(c) *(2 points)* Assume that right now $P = 11$, how many firms of each type will produce?

(d) *(2 points)* If some firms enter, which type will they be and why?

(e) *(3 points)* In the long run what will be the **unique** equilibrium price? How many of each type of firm will there be?

(f) *(4 points)* Assume the government charges a per-unit tax of t, in the long run what will be the tax burden of the firms? Explain.

5. *(11 points total)* Let $c(q)$ be a cost function, $AVC(q) = \frac{c(q)-F_{su}}{q}$, and $MC(q) = \frac{dc(q)}{dq} > 0$. You may assume that $\frac{dMC(q)}{dq} \geq 0$.

   (a) *(4 points)* Show that if $\frac{dAVC(q)}{dq} \geq 0$ then $MC(q) \geq AVC(q)$.

   (b) *(3 points)* Further show that if q^{sd} minimizes average cost, then $MC\left(q^{sd}\right) = AVC\left(q^{sd}\right)$.

   (c) *(4 points)* We assume that if $P \geq MC\left(q^{sd}\right)$ then the firm will supply $q(P)$ which is defined as $P = MC(q(P))$, use what you showed above to show that the firms variable profit $(\pi + F_{su})$ will be greater than zero.

6. *(14 points total)* Assume we have a cost function $c(w, r, p_m, q)$ where $w > 0$ is the cost of a unit of labor, $r > 0$ is the opportunity cost of a unit of capital, $p_m > 0$ is the cost of a unit of materials and $q > 0$ is the amount of output produced.

   (a) *(8 points)* Prove that this function is non-decreasing in input prices, i.e. that $\frac{\partial c}{\partial w} \geq 0$, $\frac{\partial c}{\partial r} \geq 0$, and $\frac{\partial c}{\partial p_m} \geq 0$. You may use a graphic proof, but you will get at most a third of the credit unless you can explain how your proof generalizes.

   (b) *(3 points)* How do we know that $\frac{\partial c}{\partial w} = L(w, r, p_m, q)$ or the input demand for labor? Explain.

   (c) *(3 points)* How do we know that $\frac{\partial L(w,r,p_m,q)}{\partial w} \leq 0$ or an input demand is decreasing in its own price? Explain.