ECON 107
Second Midterm

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

This exam will last 100 minutes.

It will start at approximately 13:40 and end at 15:20.

1. *(14 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 neither help others nor use a calculator or other electronic aid for calculation.

   Name and Surname: _
   Student ID: _
   Signature:

   _

2. *(20 points total)* Suicide bombers are strange lot, they give up their life in the hope that they kill civilians.

   (a) *(4 points)* Are suicide bombers rational? Explain your answer.

   Solution 1 *Yes, by default they are rational. In this case they have been convinced that they will be martyrs in a holy war against some power they have no chance of defeating using standard methods.*

   (b) *(4 points)* Define what it means for a person to be *rational* in Economics.

   Solution 2 *It means they are always choosing the best outcome for themselves.*

   (c) *(4 points)* Why is it important for social scientists in particular to assume that people are rational?

   Solution 3 *I think the best explanation is humility and respect.*

   Humility to recognize that just because your subjects don't have a PhD doesn't mean that they are stupid. You have no justification to assume that you can figure something out they cannot.

   Respect to recognize that almost all of the time you are studying something that is very important to the people involved in the interaction. It would be the height of arrogance to assume they could not figure something out that you can.

   Notice that assuming people are stupid is usually not done honestly. They say something "well the peasants have strange preferences" or some such. Be careful, treating your subjects with respect is important.

(d) *(4 points)* Define *Pareto efficiency.* (If you use the concept of Pareto dominance then you have to define that as well.)

Definition 4 *An allocation is* Pareto efficient *if there is no way to make some strictly better off without making others strictly worse off.*

An allocation is Pareto dominated *if there is another allocation that makes some strictly better off without making others strictly worse off.*

An allocation is Pareto efficient *if it is not Pareto dominated.*

(e) *(4 points)* I say that if suicide bombers are rational then suicide bombing is Pareto efficient. Do you agree? Explain—in simple enough terms that a middle school student could understand.

Solution 5 *It is indeed, and the reason is transparent. A suicide bomber is trading the* chance *to kill civilians for all of the rest of their life. Their actions are directly saying there is no feasible allocation they prefer to killing as many as possible. Thus it is not possible to Pareto improve on this allocation and it is Pareto efficient.*

a	b	c	d	μ	P^*	Q^*	P^e	Q^e
32	1	19	2	6	17	15	21	11
37	1	11	3	8	12	25	18	19
56	2	19	3	5	15	26	18	20
28	$\frac{2}{3}$	2	$\frac{1}{3}$	3	30	8	31	$\frac{22}{3}$

3. *(24 points total)* In the market for Barbie dolls the demand curve is $Q = a - bP$ and the supply curve is $Q = -c + dP$.

(a) *(6 points)* Find the equilibrium price and quantity.

$$\begin{aligned} a - bP &= -c + dP \\ P^* &= \frac{a+c}{b+d} \end{aligned}$$

$$\begin{aligned} Q^* &= a - b\left(\frac{a+c}{b+d}\right) = \frac{ad-bc}{b+d} \\ Q^* &= -c + d\left(\frac{a+c}{b+d}\right) = \frac{ad-bc}{b+d} \end{aligned}$$

(b) *(8 points)* It has been discovered that due to the toxic dies in Barbie's blond hair that each unit imposes a marginal externality cost of μ. Given this, find the efficient price and quantity of Barbie dolls to produce.

Solution 6 *One way that we can model this is to let the supply curve shift up by the amount of the externality. In order to do this properly we have to transform the demand curve into the inverse demand curve—i.e. what we see in the graph.*

$$Q = -c + dP$$

$$P = \frac{1}{d}(Q + c)$$

to this we add the marginal cost of the externality:

$$P = \frac{1}{d}(Q + c) + \mu$$

and then we can transform it back into a supply curve, this time accounting for the marginal cost of the externality.

$$Q = -c + d(P - \mu)$$

and after all this work we realize that μ can be thought of as a tax. Now we can solve for the optimal price and quantity:

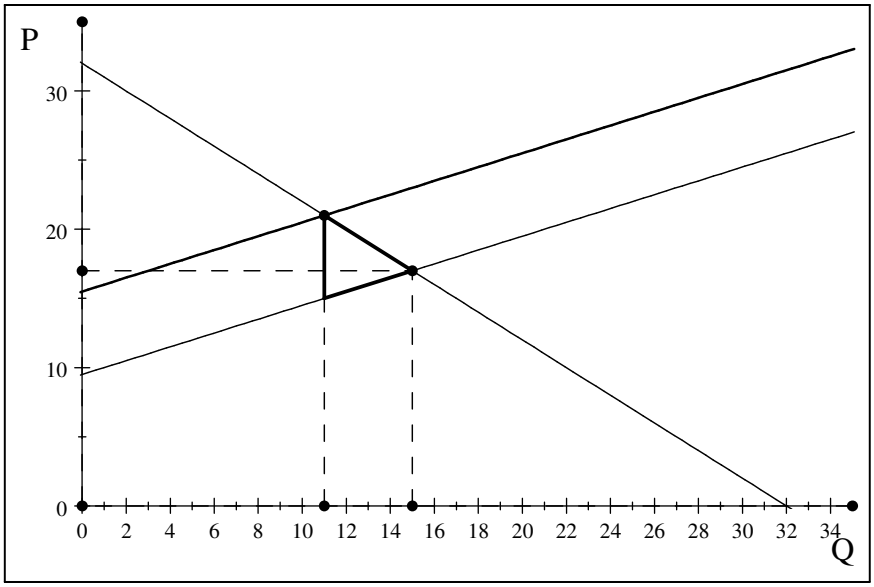
$$\begin{aligned} -c + d(P - \mu) &= a - bP \\ P^e &= \frac{a + c}{b + d} + \frac{1}{b + d} d\mu \\ Q^e &= a - b\left(\frac{a + c}{b + d} + \frac{1}{b + d} d\mu\right) \\ &= \frac{ad - bc}{b + d} - \frac{1}{b + d} bd\mu \end{aligned}$$

(c) *(7 points)* In the graph below graph the demand curve, the supply curve, and then the supply curve when the externality cost has been accounted for. Your graphing should be *approximately* correct.

Indicate the equilibrium price and quantity, and the efficient quantity.

Indicate the triangle that is the deadweight loss from the externality.

Label it DWL.



Solution 7 *I will give an exact answer for the problem where:*

a	b	c	d	μ	P^*	Q^*	P^e	Q^e
32	1	19	2	6	17	15	21	11

The supply curve is the light upward sloping line, the darker upward sloping line is the supply curve when the marginal cost of the externality is included. The downward sloping line is the demand curve. The point indicated by dashed line is the competitive equilibrium, the point indicated by a dotted line is the efficient quantity.

Finally the deadweight loss is the triangle outlined in a very dark line.

(d) *(3 points)* The government is considering imposing a tax to reduce the quantity of Barbie dolls produced, what would be the optimal level for this tax and why?

Solution 8 *The appropriate tax would be τ, since this is the amount each Barbie unit imposes on society.*

4. *(14 points total)* About *club goods*:

(a) *(4 points)* Define a *club good*, is it rival or not? Is it excludable or not?

Solution 9 *A club good is non-rival but excludable.*

(b) *(4 points)* Give three examples of club goods. You will only get full credit if one of your examples is critical to the development of the modern economy.

Solution 10 *The critical example is patents, which might be worth more than 20% of the worlds modern economy.*

Some other examples are movies, books, toll roads, private clubs, streaming services, etcetera.

(c) *(6 points)* What are the two inefficiencies associated with production of a club good? Define each of them and explain how making one of them less inefficient often means making the other one more inefficient.

Solution 11 *These are* underprovision *and* exclusion*.*

Underprovision is the fact that the firm's revenue is probably about half of the total social benefit of the good, and thus firms have too little incentive to innovate.

Exclusion is the fact that only people who are willing to pay the required fees by the provider will benefit from the club good but since it is non-rival it would be socially optimal if everyone did.

As a simple example of how making one less inefficient will make the other more. If we reduce the fees the provider charges this will decrease the amount of exclusion, but at the same time it will reduce the revenue thus making the problem of underprovision worse.

5. *(16 points total)* About costs and the long run.

(a) *(4 points)* Define the *long run* in Economic theory.

Solution 12 *The point in time in the future when all inputs will be variable.*

(b) *(4 points)* Do we ever reach the long run? Explain.

Solution 13 *No, because firms are constantly re-investing in their capital and etcetera, and each time they do they push the long run back.*

A lot of you answered with why it was important or why it mattered given that it is never reached, but that does not ***explain*** *why we do not reach the long run.*

(c) *(4 points)* Define a *sunk cost.*

Definition 14 *A* non-recoverable *cost. Like debt, once incurred it must be paid. Or like a ticket, once it is bought you cannot get your money back even if you do not use it.*

(d) *(4 points)* What happens to sunk costs in the long run? Do they disappear? Do they become some other type of costs?

Solution 15 *They do not disappear, they might change somewhat because we will buy different capital, but to the first order they will stay the same. Its just at that point in time we will have to buy all of our capital new, and that will make it a start up cost.*

6. *(12 points total)* About optimization.

   (a) *(4 points)* Define the *Bang for the Buck*.

   Definition 16 *it is the ratio of marginal utility to price, mathematically:* $\frac{MU_x}{p_x}$.

   (b) *(8 points)* In consumer theory we say that a consumer should maximize the bang for the buck, while in production theory we say a firm should use a resource as long as the marginal profit is non negative (loosely speaking the marginal product is above the per-unit cost of that input). Explain why there is this critical difference.

   Solution 17 *This is because in utility theory we have a fixed budget, or income, while in producer theory we can borrow as much money as we need.*

   When you have a fixed income and will spend all of it, you want to make sure the pleasure per dollar is as high as possible. This is what you are doing when you maximize the BfB.

   On the other hand, firms are unconstrained. Thus the question they need to answer is "is it worth spending money on" and that means you continue purchasing if $MU_x > p_x$ *or* $MU_x - p_x > 0$.