Intermediate Microeconomics
ECNS 301
Spring 2013

Exam #: 1
Version A

Friday February 8, 2013

Name: ________________________________________________________________

Instructions:
You must answer all of the following questions. Each question is worth the same amount. You have the class period to complete the exam.

Answer each question clearly and concisely. You must show your work to receive credit.

This exam is given under the rules of the Montana State University. By printing your name above you acknowledge the University’s Honor Code and agree to comply with the provisions of the Honor Code. You may not use notes or receive any assistance. There is to be no talking during the exam. You may use a calculator, but are never allowed to use device allowing you to take photographs or transmit over a network. No notes, no assistance, no talking, no cell phones, but you can use a calculator.

Clearly print your name above, in the space provided on the next page and in your blue book(s). You must turn in the exam and your blue book(s). There are two versions of the exam. Indicate your exam version on your blue book. It is your responsibility to make sure your version of the exam is different from the students next to you. If you have the same version as any of the students next to you, you will be asked to move.
True/False/Uncertain Plus Explanation

1. For each of the following, state whether it is true, false or uncertain and explain your answer. No points are given without explanation. (25)

(a) If a good is not produced, then there is no demand for it.

Solution: False, demand is independent of supply.

(b) Only in the case of perfectly inelastic demand will consumers pay the full amount of a tax.

Solution: False, another case is if supply is perfectly elastic. Consumers pay the full amount of the tax in both cases.

(c) An increase in a consumer’s income will increase the marginal rate of transformation.

Solution: False, the budget constraint shifts out, but the ratio of prices stays the same.

(d) Indifference curves on the same indifference map can have different shapes.

Solution: True, there’s nothing that says they have to have the same shapes. Indifference curves can’t cross, be thick, and they must be convex.

Short Answer/Numerical

2. You meet someone who knows nothing about economics, has never taken calculus and is generally pretty bad at math. You’d like to impress them with your intuitive understanding of some economic concepts. Briefly explain, in a few sentences, each of these concepts in a way this person will understand. (25)

(a) Marginal utility

Solution: Marginal utility is how much better you feel from getting one more.

(b) Marginal rate of substitution

Solution: The marginal rate of substitution describes how you would give up one good for another.
(c) Comparative statics

**Solution:** Comparative statics determine how your decisions/actions change due to a change outside of your control.

(d) Explain why preferences must satisfy the condition of “more is better”

**Solution:** More is always better because you could just give away/sell whatever you get more of. In this case you won’t be worse off.

3. The market supply and demand functions for a particular market are as follows.

\[
Q = 550 - 20p \\
Q = 5p - 50
\]

Quantitatively (with numbers) answer the following questions.

(a) Describe the market equilibrium price, quantity, and welfare measures.

**Solution:** Set demand equal to supply and solve for price.

\[
550 - 20p = 5p - 50 \\
600 = 25p \\
p = 24
\]

When \( p = 24 \),

\[
Q = 550 - 20(24) = 70 \\
Q = 5(24) - 50 = 70
\]

Now we need to find the welfare measures: consumer surplus, producer surplus, and total surplus. Note that for demand 550 is the intercept on the \( Q/\)horizontal axis. We want to find the intercept on the \( p/\)vertical axis. When \( Q = 0 \), \( 20p = 550 \) so \( p = 27.5 \). Consumer surplus is

\[
CS = \frac{1}{2}(27.5 - 24)70 = 122.5.
\]

Using supply when \( Q = 0 \), \( 5p = 50 \), so \( p = 10 \). Producer surplus is

\[
PS = \frac{1}{2}(24 - 10)70 = 490.
\]

Total surplus is \( 122.5 + 490 = 612.5 \). Alternatively, you can find total surplus as

\[
TS = \frac{1}{2}(27.5 - 10)70 = 612.5.
\]
(b) What happens to the market equilibrium when the government imposes an ad-valorem tax on sellers of 20%?

**Solution:** For an ad-valorem tax on sellers, the price for sellers is \( p = p_t - \tau p_t \) where \( \tau = 0.2 \). We use a minus sign because the tax on sellers results in them getting a lower price. Setting demand equal to supply we get

\[
\begin{align*}
550 - 20p_t &= 5(p_t - 0.2p_t) - 50 \\
600 &= 24p_t \\
p_t &= 25.
\end{align*}
\]

When \( p_t = 25 \), buyer pay 25 and sellers get 25 \(- 0.2)25 = 20 \). Putting 25 into the demand equation or 20 into the supply equation yields the equilibrium quantity with the tax:

\[
\begin{align*}
Q &= 550 - 20(25) = 50 \\
Q &= 5(20) - 50 - 50.
\end{align*}
\]

(c) A policy maker watches a rerun of Robin Hood on TV (the one with Kevin Costner and Morgan Freeman). In their dream that night, they get a crazy idea to steal from the rich and give to the poor. For some reason they think that firms are rich and consumers are poor. What happens to the market equilibrium when they keep the ad-valorem tax on sellers of 20% and give an ad-valorem subsidy of 20% to buyers?

**Solution:** The ad-valorem tax on sellers is modeled in the same fashion as above. The ad-valorem subsidy for buyers lowers the price they have to pay so that \( p = p_t - \tau p_t \) where \( \tau = 0.2 \). Setting demand equal to supply we get

\[
\begin{align*}
550 - 20(p_t - 0.2p_t) &= 5(p_t - 0.2p_t) - 50 \\
600 &= 20p_t \\
p_t &= 30.
\end{align*}
\]

When \( p_t = 30 \), buyers pay 30 \(- 0.2)30 = 24 \) and sellers get 30 \(- 0.2)30 = 24 \). The equilibrium quantity is 70.

(d) As an adviser to the policy maker would you advise them to keep the Robin Hood style tax/subsidy or to just keep the ad-valorem tax on sellers? Why?

**Solution:** With the ad-valorem tax on sellers, you generate 50(5) = 250 of tax revenue, but the tax also creates a deadweight loss. With the Robin Hood style tax/subsidy, no tax revenue is generated as all tax revenue is given back to
the consumers in the form of a subsidy. The Robin Hood style tax/subsidy is efficient as the free market equilibrium is achieved.

If the policy maker is more concerned with efficiency, I would advise them to use the Robin Hood style tax/subsidy. Although in this case it would be better to have no tax at all.

If the policy maker needs to generate some tax revenue, I would advise them to just keep the ad-valorem tax on sellers.

4. There’s a sub par fast food taco place in town that you tend to frequent only after a night of drinking. (Of course you always walk or get a ride from a designated driver.) Your preferences for beer and tacos are described by the following utility function

\[ u(b, t) = \min\{3b, t\} \]

where \( b \) is the quantity demanded of beer and \( t \) is the quantity demanded of tacos. Let \( p_b = 3 \) be the price of a beer, \( p_t \) be the price of tacos, and \( m = 6 \) be the amount of money you have to spend on beer and tacos.

(a) What are your demand functions for tacos and beer?

**Solution:** We know that in equilibrium \( 3b = t \). Use this condition along with the budget constrain to determine demand.

\[
\begin{align*}
  p_b b + p_t t &= m \\
  p_b b + p_t (3b) &= m \\
  b(p_b + 3p_t) &= m \\
  b &= \frac{m}{(p_b + 3p_t)} \\
  t &= 3b = \frac{3m}{(p_b + 3p_t)}.
\end{align*}
\]

When \( m = 6 \) and \( p_b = 3 \),

\[
\begin{align*}
  b &= \frac{6}{(3 + 3p_t)} = \frac{2}{(1 + p_t)} \\
  t &= 3b = \frac{6}{(1 + p_t)}.
\end{align*}
\]
(b) If the supply function of tacos is \( t = 2p_t - 2 \), what is the price of tacos and how many tacos and beer do you buy?

**Solution:** The demand for tacos is \( t = \frac{6}{(1 + p_t)} \). Setting demand equal to supply we get

\[
\frac{6}{(1 + p_t)} = 2p_t - 2
\]

\[
3 = (1 + p_t)(p_t - 1)
\]

\[
3 = p_t^2 - 1
\]

\[
4 = p_t^2
\]

\[
p_t = 2.
\]

When \( m = 6 \), \( p_b = 3 \) and \( p_t = 2 \),

\[
b = \frac{2}{(1 + p_t)} = \frac{2}{3}
\]

\[
t = \frac{6}{(1 + p_t)} = 2.
\]

(c) All of a sudden you find an extra $10 to spend on beer and tacos. How does the extra $10 influence the price of tacos and the number of tacos and beers you buy?

**Solution:** The extra $10 is an increase in income. The increase in income will increase demand resulting in an increase in price and quantity demanded. The demand functions for beer and tacos are

\[
b = \frac{m}{(p_b + 3p_t)}
\]

\[
t = \frac{3m}{(p_b + 3p_t)}.
\]

Now \( m = 16 \) and \( p_b = 3 \). The demand curves reduce to

\[
b = \frac{16}{3(1 + p_t)}
\]

\[
t = \frac{16}{(1 + p_t)}.
\]
Setting the demand curve for tacos equal to the supply we get

\[ \frac{16}{1 + p_t} = 2p_t - 2 \]

\[ 8 = (1 + p_t)(p_t - 1) \]

\[ 8 = p_t^2 - 1 \]

\[ 9 = p_t^2 \]

\[ p_t = 3. \]

When \( m = 16, \ p_b = 3 \) and \( p_t = 3 \),

\[ b = \frac{16}{3(4)} = \frac{4}{3} \]

\[ t = \frac{16}{4} = 4. \]

(d) Your drinking buddy, whose had quite a few more than you, tries to tell you that since the price of tacos increased after you found more money that these tacos are an inferior good. Is your drinking buddy right or wrong and why?

**Solution:** Your drinking buddy is crazy for multiple reasons. Tacos are a normal good if the income elasticity of demand is positive, and an inferior good if the income elasticity of demand is negative. The increase in income, increases demand. This change tells you nothing about the income elasticity of demand, but it might tell you something about the price elasticity of supply. (We have two different points on two different demand curves, but two different points on one supply curve.)

Also, the income elasticity of tacos is

\[ \frac{\partial t}{\partial m} \cdot \frac{m}{t}. \]

Since \( m \) (income) and \( t \) (quantity demanded of tacos) are both non-negative, the sign of \( \frac{\partial t}{\partial m} \) determines whether or not tacos are a normal or inferior good.

We found the demand of tacos to be

\[ t = \frac{3m}{(p_b + 3p_t)} \]

so that

\[ \frac{\partial t}{\partial m} = \frac{3}{(p_b + 3p_t)} > 0. \]

This makes tacos a normal good.