Ecn 100 - Intermediate Microeconomics
University of California - Davis May 6, 2011
Instructor: John Parman

Midterm 2 - Solutions

You have until 11:50am to complete this exam. Be certain to put your name, ID number and section on both the exam and your scantron sheet and fill in test form A on the scantron. Answer all multiple choice questions on your scantron sheet. Choose the single best answer for each question; if you fill in multiple answers for a question you will be marked wrong. Answer the long answer questions directly on the exam. You must show your work where relevant for full credit. Good luck!

Name: **ID Number:** **Section:**

SECTION I: MULTIPLE CHOICE (60 points)

1. Suppose that the price of rice increases. The sign of the substitution effect for rice will be:
   (a) Negative if rice is a Giffen good.
   (b) Negative if rice is an ordinary good.
   (c) Both (a) and (b) are true.
   (d) Neither (a) nor (b) is true.

   (c) Regardless of what type of good something is, the substitution effect is always negative for a good that became relatively more expensive and positive for a good that became relatively cheaper.

2. There are ten consumers in the market for apples. All ten consumers have identical individual demand curves with a slope of -2. The slope of the market demand curve will be:
   (a) -2.
   (b) $-\frac{1}{5}$.
   (c) $-\frac{1}{40}$.
   (d) None of the above.

   (b) For each individual consumer, the slope of -2 implies that when price decreases by \$2, demand increases by one unit. So when price decreases by \$2, each of the ten consumers demands one more unit making the total change in market demand ten units. This gives us a slope of the market demand curve of $-\frac{2}{10}$ or $-\frac{1}{5}$.

3. Coffee and donuts are the only two goods that Alex buys and both of them always have positive marginal utilities. If donuts are a luxury good, then we can say for certain that:
   (a) Coffee is an inferior good.
   (b) Coffee is a normal good.
   (c) The income elasticity of demand for coffee is less than zero.
   (d) The income elasticity of demand for coffee is less than one.

(d) If income goes up by one percent, total spending can go up by no more than one percent. If donuts are a luxury good, it means that spending on donuts goes up by more than one percent when income increases by one percent. So spending on coffee must go up by less than one percent. This means that the income elasticity of demand for coffee must be less than one.

4. Suppose that apples and bananas are both normal, ordinary goods and are complements. The sign of the slope of the income offer curve will be:

   (a) The same as the sign of the slope of the Engel curve for apples.
   (b) The opposite of the sign of the slope of the Engel curve for apples.
   (c) The same as the sign of the slope of demand curve for apples.
   (d) None of the above.

   (a) The income offer curve will have a positive slope. When income increases, demand for both goods will increase since they are both normal. This means that as income increases, the optimal bundle moves up and to the right, tracing out an upward sloping income offer curve. The Engel curve for apples will also have a positive slope. When income goes up, demand for apples goes up since apples are normal. This means that the Engel curve, which graphs income relative to demand for apples, will be upward sloping. The demand curve for apples will be downward sloping since apples are an ordinary good (note that apples cannot be a Giffen good since we know that they are not inferior).

5. Suppose that apartments are an ordinary good and demand for apartments is inelastic. A decrease in the price of apartments will:

   (a) Increase consumer surplus.
   (b) Decrease consumer suprlus.
   (c) Have no effect on consumer surplus.
   (d) Not enough information.

   (a) If apartments are ordinary, it means that the demand curve for apartments will be downard sloping. So if the price of apartments decreases consumers will move down and right along their demand curve. This will increase the area below the demand curve above the price, increasing consumer surplus.

6. In which of the following cases would the income and subsitution effects for books have the same sign?

   (a) When books are a normal, ordinary good and the price of books increases.
   (b) When books are an inferior, ordinary good and the price of books increases.
   (c) When books are a Giffen good and the price of books increases.
   (d) None of the above.

   (a) If the price of books increases, the substitution effect for books will be negative since they became relatively more expensive. With the price increase, the consumer feels like effective income has decreased. If books are normal, this decrease in income will lead to a negative income effect for books.

7. Which of the following is the best ordering of goods from most inelastic to most elastic in terms of the price elasticity of demand?
   (a) Oreo cookies, all cookies, all snacks (including cookies).
   (b) All snacks (including cookies), all cookies, Oreo cookies.
   (c) Oreo cookies, all snacks (including cookies), all cookies.
   (d) All cookies, Oreo cookies, all snacks (including cookies).

   (b) Goods with more close substitutes will tend to be more elastic (if the price rises, consumers will switch to buying the substitutes). There are many close substitutes for Oreos, fewer close substitutes for cookies, and even fewer close substitutes for snacks in general.

8. Suppose that bread and sushi are the only two goods Bob consumes. Both have positive marginal utilities. If bread is a Giffen good and the price of bread increases:
   (a) Spending on sushi will increase.
   (b) Spending on sushi will decrease.
   (c) Spending on sushi will stay the same.
   (d) Not enough information.

   (b) If bread is a Giffen good and the price of bread increses, Bob will purchase more bread. His spending on bread will go up (he is buying more and each unit costs more than it did before). This means he must be spending less on sushi than he did before.

Use the following information to answer questions 9 and 10. The demand for toys (T) and the demand for gadgets (G) as functions of the price of toys (p_T), the price of gadgets (p_G) and income (I) are given by:

$$T = \frac{I}{2p_T}$$

$$G = \frac{I}{2p_G}$$

Dave currently has an income of \$100. The price of a toy is \$10. The price of a gadget is \$1.

9. Suppose that the price of a gadget increases to \$2. The change in demand for the toys due to the income effect will be:
   (a) 2.5.
   (b) 7.5.
   (c) -2.5.
   (d) 0.

   (c) To get the income effect, we need to find our original optimal bundle, our final optimal bundle and our intermediate optimal bundle. The origial optimal bundle can be found by plugging actual income and the original prices into the demand equations. This would give us an original bundle with 5 toys and 50 gadgets in it. The final bundle can be found by plugging actual income and the new prices

into the demand equations. This gives a final bundle of 5 toys and 25 gadgets. To get the intermediate bundle, we first need to calculate the income that would make the original bundle affordable under the new prices. It would take \$150 to buy the original 5 toys and 50 gadgets when the price of a toy is \$10 and the price of a gadget is \$2. Plugging this adjusted income and the new prices into the demand equations gives us an intermediate bundle with 7.5 toys and 37.5 gadgets. The income effect for toys is equal to the amount of toys in the final bundle (5) minus the number of toys in the intermediate bundle (7.5). This gives us an income effect of -2.5.

10. The magnitude of the substitution effect for toys will be:
    (a) Equal to the magnitude of the income effect for toys.
    (b) Greater than the magnitude of the income effect for toys.
    (c) Less than the magnitude of the income effect for toys.
    (d) Not enough information.

    (a) We could see this from our calculations in the previous question. However, we can also see the answer with no calculations whatsoever. Notice that the demand for toys does not depend on the price of gadgets. The only way this is possible is if the income and substitution effects cancel each other out which would imply that they have opposite signs and are equal in magnitude.

11. Suppose that there are two consumers in the market for hats. Both consumers have linear demand curves with different slopes but the same vertical intercept. Assuming that hats are an ordinary good, the market demand curve:
    (a) Will have a kink and be steeper to the left of the kink than to the right of the kink.
    (b) Will have a kink and be steeper to the right of the kink than to the left of the kink.
    (c) Will be a straight line without a kink.
    (d) None of the above.

    (c) Since both consumers have the same vertical intercept for their demand curves, they will both enter the market at the same price. This means that there will not be kink in the demand curve. We would only get a kink if they entered at different prices (the intercept would be the price at which the first person entered the market and the kink would occur at the price at which the second person entered the market).

12. At the current rental price, demand for movie rentals is inelastic. If the movie rental store lowers the price by a small amount:
    (a) The quantity of rentals will increase and the store's revenue will decrease.
    (b) The quantity of rentals will decrease and the store's revenue will decrease.
    (c) The quantity of rentals will increase and the store's revenue will increase.
    (d) The quantity of rentals will decrease and the store's revenue will increase.

    (a) If the price goes down, demand will increase. Since demand is currently inelastic, the change in revenue will have the same sign as the change in price. If price goes down, revenue goes down. The intuition behind this is that demand is not very

responsive to price. Lowering price will only gain the store a few new customers. The extra revenue from these new customers will not be enough to make up for the revenue lost on the units that were being sold before and are now being sold at a lower price.

13. William spends his entire income on soda and chips. He always buys positive quantities of both. Suppose that the cross price elasticity of demand for soda with respect to the price of chips is negative. If chips are an ordinary good, when the price of chips increases:
    (a) William's spending on chips will increase and his spending on soda will decrease.
    (b) William's spending on chips will decrease and his spending on soda will decrease.
    (c) William's spending on chips will increase and his spending on soda will increase.
    (d) William's spending on chips will decrease and his spending on soda will increase.

    (a) Since the cross price elasticity is negative, an increase in the price of chips will lead to a decrease in the amount of soda consumed. So spending on soda will go down. Since William is spending all of his income and spending on soda decreases, spending on chips must increase.

14. The market demand curve for video games is downward sloping. Consumers currently purchase 200 video games. If the price of a video game drops by \$2, the change in consumer surplus will be:
    (a) -400.
    (b) -200.
    (c) 400.
    (d) None of the above.

    (d) Consumer surplus will increase by 400 on the units already being purchased (200 units times \$2 of additional benefit on each unit). However, there will also be an increase in consumer surplus on the new units purchased, so the total change in consumer surplus will be greater than 400.

15. For an ordinary, inferior good, the Engel curve and demand curve will:
    (a) Both have positive slopes.
    (b) Both have negative slopes.
    (c) Have slopes with opposite signs.
    (d) Not enough information.

    (b) Since the good is ordinary, demand increases when price decreases leading to a downward sloping demand curve. Since the good is inferior, demand increases when income decreases leading to a downward sloping Engel curve.

SECTION II: SHORT ANSWER (40 points)

1. (15 points) Calvin's demand for books (B) and magazines (M) in terms of his income (I), the price of a book (p_B) and the price of a magazine (M) is given by the equations below:

$$B = \frac{I}{p_B + \frac{p_B^2}{p_M}} \tag{1}$$

$$M = \frac{I}{p_M + \frac{p_M^2}{p_B}} \tag{2}$$

   (a) Suppose that income is \$100 and the price of magazines is \$1. Draw the price offer curve obtained by varying the price of books. Show the points on the price offer curve corresponding to the following prices of books: \$1, \$2, and \$3. Be certain to label the exact values of these three points on the graph and the end points of the budget lines they lie on (you may leave numerical values as fractions).

   The optimal bundle when the price of books is \$1 will be:

$$B = \frac{100}{1 + \frac{1^2}{1}} = 50$$

$$M = \frac{100}{1 + \frac{1^2}{1}} = 50$$

   The optimal bundle when the price of books is \$2 will be:

$$B = \frac{100}{2 + \frac{2^2}{1}} = \frac{50}{3}$$

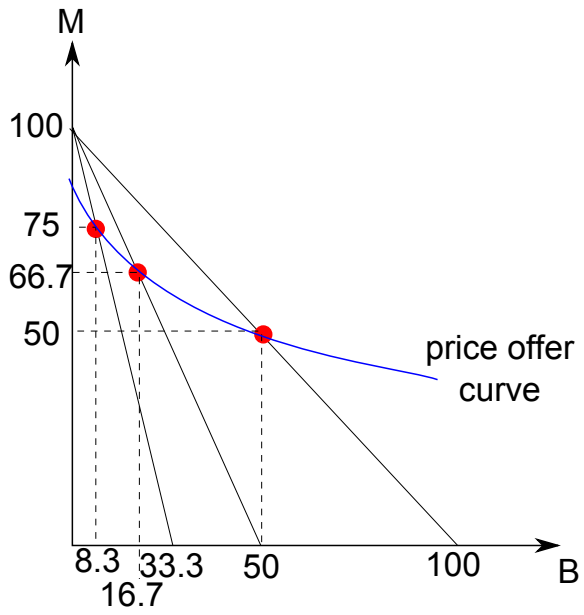
$$M = \frac{100}{1 + \frac{1^2}{2}} = \frac{200}{3}$$

   The optimal bundle when the price of books is \$3 will be:

$$B = \frac{100}{3 + \frac{3^2}{1}} = \frac{25}{3}$$

$$M = \frac{100}{1 + \frac{1^2}{3}} = 75$$

   Now we can simply graph these bundles on the appropriate budget lines:



(b) Graph the Engel curve for magazines assuming that the price of a magazine is \$1 and the price of a book is \$1. Label any intercepts and slopes with their exact numerical values where possible.

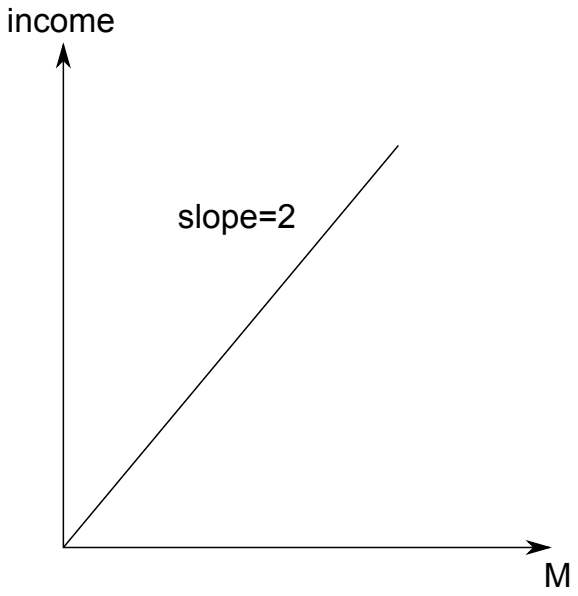
Plugging in the prices into the demand equation for magazines gives us:

$$M = \frac{I}{1 + \frac{1^2}{1}} = \frac{I}{2}$$

Rearranging this equation to get income in terms of M gives us:

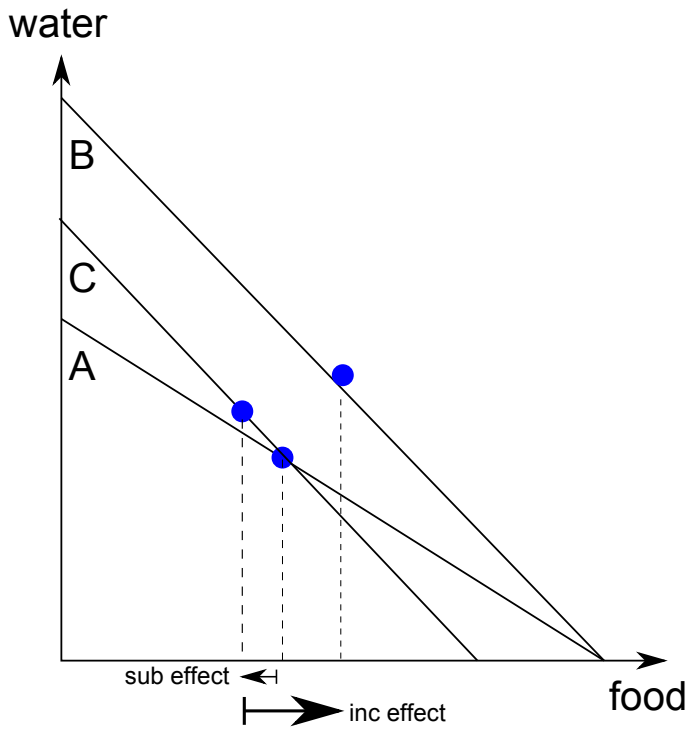
$$I = 2M$$

So the Engel curve for magazines will be a straight line with a slope of 2 that passes through the origin:


income
slope=2
M

2. (15 points) The graph below shows three budget lines for a person who consumes only food and water. Budget line A is the consumer's original budget line. Budget line B is the consumer's new budget line after a decrease in the price of water. Budget line C is a budget line that is parallel to budget line B but passes through the consumer's original optimal bundle on budget line A. Water is a normal, ordinary good. Food is also normal and ordinary. Water and food are complements. Show the following on the graph:
   (a) Where the consumer's new optimal bundle will be on budget line B.
   (b) Where the consumer's optimal bundle would be on budget line C.
   (c) The portion of the change in demand for food from the price decrease due to the income effect.
   (d) The portion of the change in demand for food from the price decrease due to the substitution effect.

   Since water is ordinary, the amount of water should increase when the price of water decreases. Since food is a complement, the amount of food should increase when the price of water decreases. So the new optimal bundle on budget line B should be up and to the right of the original bundle. Since both food and water are normal goods, the intermediate bundle should have less food and less water than the final bundle. So the optimal bundle on budget line C should be below and to the left of the optimal bundle on budget line B. The substitution effect is the change from the original bundle to the intermediate bundle. The income effect is the change from the intermediate bundle to the final bundle.



3. (10 points) The inverse demand curves for consumers A and B are given below:

$$p(x_A) = 10 - x_A \tag{3}$$

$$p(x_B) = 20 - 2x_B \tag{4}$$

(a) Derive an expression for market demand as a function of price.

Notice that consumer A begins consuming when the price drops below 10. Consumer B starts consuming when the price drops below 20. So at prices above \$20, market demand will be equal to zero. For prices between \$10 and \$20 market demand will be equal to x_B. For prices below \$10, market demand will be equal to x_A plus x_B. To get the actual equations, we first need to rearrange the inverse demand functions to get demand as a function of price:

$$x_A = 10 - p$$

$$x_B = 10 - \frac{1}{2}p$$

So the market demand function is:

$$x(p) = 0 \text{ for } p > 20$$

$$x(p) = x_B = 10 - \frac{1}{2}p \text{ for } 10 < p \leq 20$$

$$x(p) = x_A + x_B = 10 - p + 10 - \frac{1}{2}p = 20 - \frac{3}{2}p \text{ for } p \leq 10$$

(b) Graph the market demand curve, labeling all intercepts, kinks and slopes with their numerical values.