Ecn 100 - Intermediate Microeconomic Theory
University of California - Davis
Professor John Parman

October 16, 2008

Midterm 1

You have until 6pm to complete the exam, be certain to use your time wisely. For multiple choice questions, circle the letter for the correct answer. Choose only one answer for each multiple choice question; if more than one letter is circled for a question it will be marked wrong. For the short answer questions, show your work clearly, place a box around final answers and be certain to label any graphs you draw. Final answers may be left as fractions. Non-graphing calculators may be used but they are not necessary. Good luck!

SECTION I: MULTIPLE CHOICE (75 points)

1. Donna hates anchovies. At all levels of anchovy consumption, she considers anchovies a 'bad'. Donna's marginal utility from anchovies must be:
   (a) Positive.
   (b) Negative.
   (c) Increasing as the number of anchovies gets larger.
   (d) Decreasing as the number of anchovies gets larger.

   (b) If anchovies are a bad, as the number of anchovies increases, utility decreases. So marginal utility from anchovies must be negative.

2. Consider two preference relations. One is 'taller than' and is defined as 'if person A is taller than person B, then person A $\succ$ person B'. The other is 'at least as tall as' and is defined as 'if person A is at least as tall as person B, then person A $\succeq$ person B'. Which of the following is *not* true?
   (a) Both preference relations are transitive.
   (b) Both preference relations are reflexive.
   (c) Under the first preference relation, person C $\succ$ person D and person D $\succ$ E implies that person C is taller than person E.
   (d) None of the above.

   (b) For the 'taller than' preference relation, reflexivity does not hold (you can not have person A 'taller than' person A).

3. Suppose that potato chips are a 'good'. Then a graph of utility as a function of potato chips (with utility on the vertical axis) must:
   (a) Have a positive slope.
   (b) Have a negative slope.
   (c) Have a decreasing slope.
   (d) Have an increasing slope.
   (e) None of the above.

   (a) If potato chips are 'good', then increasing the number of potato chips increases utility. So utility is an increasing function of potato chips.

4. Still assuming that potato chips are a 'good', a graph of marginal utility of potato chips as a function of the number of potato chips (with marginal utility on the vertical axis) must:
   (a) Have a positive slope.
   (b) Have a negative slope.
   (c) Have a decreasing slope.
   (d) Have an increasing slope.
   (e) None of the above.

   (e) We only know for certain that the marginal utility is positive. We can't say whether it is increasing or decreasing as potato chips increase.

5. When Steve recieves $50 from his grandmother for his birthday, his spending on pizza goes up and his spending on textbooks goes down. Pizza and textbooks are the only goods Steve consumes. What can we say for certain?
   (a) Pizza is an inferior good.
   (b) Pizza is a Giffen good.
   (c) Textbooks are an inferior good.
   (d) Textbooks are a Giffen good.

   (c) Textbooks are inferior because the number of books purchased decreases when income increases. We don't know if textbooks are a Giffen good.

6. Which property of preferences would guarantee that the optimal consumption bundle lies on the budget line?
   (a) Preferences are monotonic.
   (b) Preferences are transitive.
   (c) Preferences are reflexive.
   (d) Preferences have a satiation point.

   (a) If preferences are monotonic, more of goods is better. So to maximize our utility, we would want to spend all of our money.

7. Suppose you have well-behaved, convex indifference curves for bundles of milk and cookies and that you are currently spending all of your income on milk and cookies. On a graph with milk on the vertical axis and cookies on the horizontal axis, the slope of the indifference curve at your current consumption bundle is steeper than the slope of the budget line. To maximize your utility given your budget constraint, you will:
   (a) Buy more cookies and less milk.
   (b) Buy more milk and fewer cookies.
   (c) Buy more milk and more cookies.
   (d) Buy less milk and fewer cookies.

   (a) If the indifference curve is steeper than the budget line, you can increase utility by moving down and right along the budget line which would mean buying more cookies and less milk.

8. Dylan's possible consumption bundles of pens and paper are graphed with pens on the vertical axis and paper on the horizontal axis. Suppose that the price of pens increases by $1 and Dylan's income decreases by $5. Dylan's new budget line:

(a) Lies entirely below his old budget line.
(b) Lies entirely above his old budget line.
(c) Intersects his old budget line at some bundle with positive amounts of pens and paper.
(d) Passes through the same point on the paper axis as the old budget line.

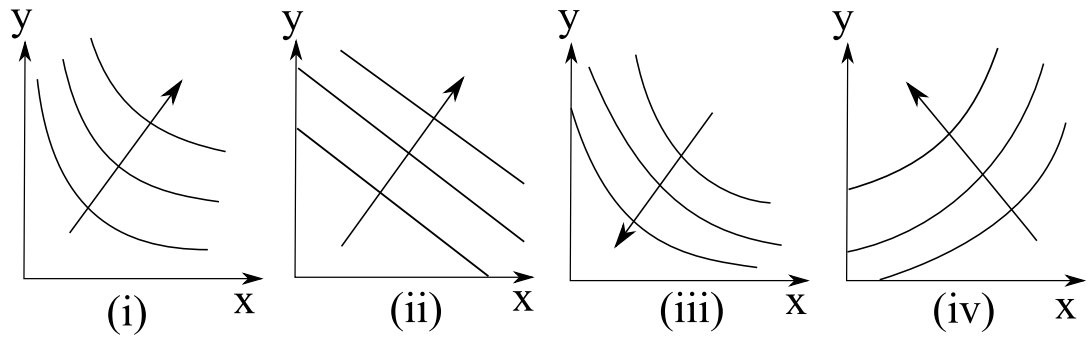
(a) The price increase rotates the budget line down and the income decrease shifts the entire budget constraint in. So every point on the new budget constraint will be below the old budget constraint.

9. When the price of good x increases, the amount of good y Kelly buys decreases. We can say that:

(a) Good x and good y are substitutes.
(b) Good x and good y are complements.
(c) Good x is inferior.
(d) Good y is inferior.

(b) The goods are complements (a increase of the price of one good leads to a decrease in the demand for the other good).

Use the following graphs to answer questions 10 through 14. Each graph shows three indifference curves for bundles of x and y. The arrow points in the direction of increasing utility.



10. Which graph represents perfect complements?

(a) (i).
(b) (ii).
(c) (iii).
(d) (iv).
(e) None of the graphs.

(e) Remember that indifference curves for perfect complements are L-shaped.

11. In which graphs is good x a 'bad'?

(a) (i) and (iii).
(b) (iii) and (iv).
(c) (iii) only.
(d) (iv) only.

(b) Utility is increasing as x decreases for these two graphs.

12. Which graph represents perfect substitutes?

    (a) (i).
    (b) (ii).
    (c) (iii).
    (d) (iv).
    (e) None of the graphs.

    (b) The indifference curves are straight lines, indicating that we are always willing to trade between x and y at a constant rate.

13. For which graphs would a consumer definitely by zero units of at least one good?

    (a) (ii).
    (b) (iii).
    (c) (iv).
    (d) (iii) and (iv).
    (e) (ii), (iii) and (iv).

    (d) For these two graphs, higher indifference curves can always be reached by moving to the left, so demand for x will be zero. For curve (ii), demand for one of the goods will be equal to zero if the budget line has a different slope than the indifference curves but demand for both could be positive if the slopes are equal.

14. For which graphs is the marginal utility of y positive?

    (a) (i) and (ii).
    (b) (i), (ii) and (iii).
    (c) (i), (ii) and (iv).
    (d) (i), (ii), (iii) and (iv).

    (c) Good y is 'good' for all three of these graphs, indicating a positive marginal utility, but is 'bad' for graph (iii), indicating a negative marginal utility.

15. Apples and bananas are normal, ordinary goods. Initially your income is \$10, apples cost \$2 each and oranges cost \$3 each. If your income goes to \$20, the price of apples rises to \$3 and the price of oranges rises to \$4.50, which of the following statements are definitely true?

    (a) The amount of money spent on apples increases.
    (b) The number of apples bought increases.
    (c) (a) and (b).
    (d) Neither (a) nor (b) is definitely true.

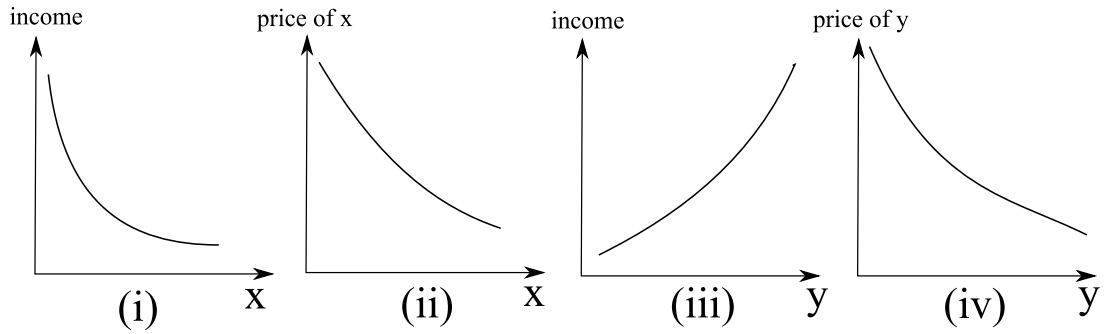
    (c) Notice that prices have risen by 50% for both apples and oranges, so relative prices have stayed the same, but income has risen by more than 50%, so purchasing power has increased. This is equivalent to a simple increase in income which for normal goods should increase the demand for both goods (and the money spent on both since demand and prices are both greater now).

16. Suppose that for a particular consumption bundle, $\frac{MU_x}{MU_y} = \frac{p_x}{p_y}$, what is definitely true?

(a) The bundle maximizes utility.
(b) The slope of the indifference curve passing through the bundle is equal to $-\frac{p_x}{p_y}$ (you can assume good x is on the horizontal axis).
(c) (a) and (b).
(d) None of the above.

(b) The equation in the problem tells us that the MRS, and therefore the slope of the indifference curve, is equal to the slope of the budget line. However, we don't know whether or not the bundle lies on the budget line.

For questions 17 through 19, use the following graphs showing Engel curves and demand curves for x and y.



17. Which of the following statements is true?

(a) x is a normal good.
(b) x is an inferior good.
(c) x is a Giffen good.
(d) x is both an inferior good and a Giffen good.

(b) x is inferior because demand decreases as income increases. x is not a Giffen good because demand decreases as price increases.

18. Which of the following statements is true?

(a) y is a normal good.
(b) y is an inferior good.
(c) y is a Giffen good.
(d) y is both an inferior good and a Giffen good.

(a) y is normal (demand increases as income increases) as well as ordinary (demand decreases as price increases).

19. Consider a graph with y on the vertical axis and x on the horizontal axis. After an increase in income, the new optimal bundle will be:

(a) Up and to the left of the original optimal bundle.
(b) Down and to the left of the original optimal bundle.
(c) Up and to the right of the original optimal bundle.
(d) Down and to the right of the orginal optimal bundle.

(a) When income increases, demand for x will fall and demand for y will rise, so the new bundle will be up and to the left of the original bundle.

20. Which of the following statements would guarantee that two utility functions, $U(x, y)$ and $V(x, y)$, represent the same preferences?
    (a) For any two consumption bundles (x_1, y_1) and (x_2, y_2), if $U(x_1, y_1)$ is greater than $U(x_2, y_2)$ then $V(x_1, y_1)$ is greater than $V(x_2, y_2)$.
    (b) For any values of x and y, the marginal rate of substitution for utility function U is the same as the marginal rate of substitution for the utility function V.
    (c) Knowing that either (a) or (b) is true would guarantee that they represent the same preferences.
    (d) Neither (a) nor (b) would guarantee that they represent the same preferences.

    (a) If this statement is true, then the two utility functions will always rank bundles the same way and therefore represent the same preferences. (b) does not guarantee the same preferences because it doesn't guarantee that utility is increasing in the same direction (think about $V(x, y) = -U(x, y)$).

21. A person's utility from goods x and y is given by $U(x, y) = 3x^3 + 4y^2$. What is the marginal utility from x when x is equal to 2 and y is equal to 2?
    (a) 40.
    (b) 52.
    (c) 36.
    (d) 60.

    (c) Take the derivate with respect to x to get $MU_x = 9x^2$ and plug in $x = 2$.

22. Assume pens and pencils are perfect substitutes and that my marginal utility from pencils is two thirds as large as my marginal utility from pens. If my income is \$20, pens cost \$1 each, and pencils cost \$.50 each, how many pencils will I buy?
    (a) 0.
    (b) 20.
    (c) 40.
    (d) I am indifferent between any bundle of pens and pencils on my budget line.

    (c) Note that pens cost twice as much as pencils but provide less than twice as much additional utility. So we will buy all pencils. With \$20 in income, we can afford 40 pencils.

23. Hamburgers and hotdogs are substitutes. Which of the following is definitely true?
    (a) Indifference curves for hamburgers and hotdogs are straight lines.
    (b) An increase in the price of hamburgers will decrease the number of hotdogs consumed.
    (c) A decrease in the price of hotdogs will decrease the number of hamburgers consumed.
    (d) Indifference curves for hamburgers and hotdogs are L-shaped.

    (c) If hotdogs get cheaper we substitute away from hamburgers (which just got relatively more expensive). Note that (a) would only be true if they were perfect substitutes.

24. You are told that candy is a normal good and that there is diminishing marginal utility to candy as the amount of candy eaten increases. What is true about a graph of utility as a function of candy (with utility on the vertical axis)?

    (a) It has a positive slope.
    (b) It has a negative slope.
    (c) It's slope is increasing then decreasing.
    (d) It's slope is constant.

    (a) The fact that candy is a normal good tells us that more is better, so utility is increasing as candy increases. Diminishing marginal utility tells us that the curve would get flatter, so it's slope would be decreasing as candy increases.

25. If a person's indifference curves for bagels and coffee are vertical lines when bagels are on the vertical axis and coffee is on the horizontal axis, which of the following is true?

    (a) The marginal utility of bagels is positive.
    (b) Bagels and coffee are perfect complements.
    (c) The marginal utility of bagels is negative.
    (d) None of the above.

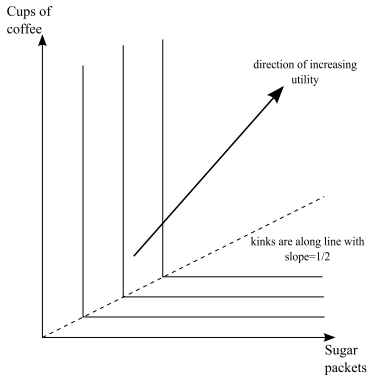
    (d) Vertical lines tell us that changing the amount of bagels does not change utility, so the marginal utility from bagels is zero. If bagels and coffee were perfect complements, the indifference curves would be L-shaped, not vertical lines.

SECTION II: SHORT ANSWER (25 points)

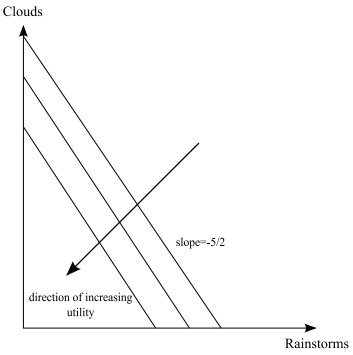
For this section, be certain to show your work and clearly label any graphs you draw. Give complete answers but keep them concise. Please place a box around final answers where appropriate.

1. For each scenario below, sketch three indifference curves. Use a different graph for each part. On your graphs, be certain to label the axes, the direction in which utility is increasing, and any kinks, intercepts or slopes with appropriate values if possible. (3 points each)

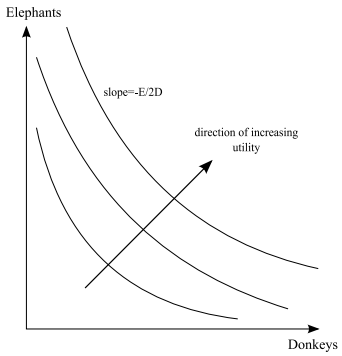
   (a) Sarah enjoys both coffee and sugar. Sarah always puts two packets of sugar in each cup of coffee she drinks. She'll never drink a cup of coffee without exactly two packets of sugar in it and never has sugar except for in her coffee. Graph her indifference curves with cups of coffee on the vertical axis and sugar on the horizontal axis.



   (b) Joe dislikes both clouds and rainstorms. Every rainstorm lowers his utility by 5 units and every cloud lowers his utility by 2 units. Graph his indifference curves with clouds on the vertical axis and rainstorms on the horizontal axis.



   (c) Hillary likes both donkeys and elephants. Her marginal utility from donkeys (D) is $\frac{1}{D}$. Her marginal utility from elephants (E) is $\frac{2}{E}$. Graph her indifference curves with elephants on the vertical axis and donkeys on the horizontal axis.

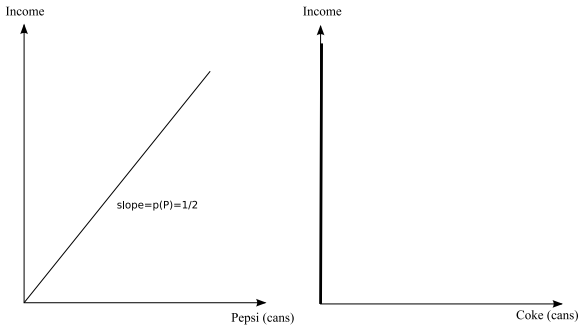

Elephants
slope=-E/2D
direction of increasing
utility
Donkeys

2. Coke and Pepsi are perfect substitutes. Suppose that your utility from cans of coke (C) and cans of pepsi (P) is given by $U(C, P) = 3C + 2P$ and that the price of a can of Coke is \$1 and the price of a can of Pepsi is \$.50. Graph the Engel curve for cans of Coke and the Engel curve for cans of Pepsi. (6 points total)

   From the utility function, we can see that Coke and Pepsi are perfect substitutes. So if the slope of the indifference curves is not equal to the slope of the budget line, we will consume all of one and none of the other. If we had coke on the horizontal axis, the slope of the indifference curves would be $MRS = -\frac{MU_C}{MU_P} = -\frac{3}{2}$. The slope of the budget line would be $-\frac{p_C}{p_P} = -2$. So the budget line is steeper than the indifference curve, and we can increase utility by moving up and to the left on the indifference curve until we are consuming all Pepsi. Spending all of our money on Pepsi, our demands are:

$$P = \frac{I}{p_P} = 2I$$
$$C = 0$$

   From these demand functions, we can graph the Engel curves:



3. Your utility from video games (V) and cd's (C) is given by the $U(V,C) = 5V^{\frac{2}{3}}C^{\frac{1}{3}}$. Derive an expression for the demand for video games in terms of the price of video games (p_V), the price of CD's (p_C) and your income (I). You must show your work for full credit. (10 points)

   To get the demand for video games, we need to solve for the optimal bundle using our tangency condition and our budget constraint:

$$MRS = -\frac{p_V}{p_C}$$

$$p_V V + p_C C = I$$

   Starting with the first equation, we can replace MRS with $-\frac{MU_V}{MU_C}$. This gives us:

$$-\frac{MU_V}{MU_C} = -\frac{p_V}{p_C}$$

$$\frac{5\frac{2}{3}V^{-\frac{1}{3}}C^{\frac{1}{3}}}{5\frac{1}{3}V^{\frac{2}{3}}C^{-\frac{2}{3}}} = \frac{p_V}{p_C}$$

$$2\frac{C}{V} = \frac{p_V}{p_C}$$

$$C = \frac{p_V}{2p_C}V$$

   Plugging this into the budget constraint, we can solve for V:

$$p_V V + p_C\left(\frac{p_V}{2p_C}V\right) = I$$

$$p_V V + \frac{p_V}{2}V = I$$

$$\frac{3}{2}p_V V = I$$

$$V = \frac{2I}{3p_V}$$

   So our demand for video games is $V = \frac{2I}{3p_V}$.