

Econ 100
Homework 1

1) Charlie likes both apples and bananas. He consumes nothing else. The consumption bundle (X,Y) represents the bundle such that Charlie consumes X bushels of apples per year and Y bushels of bananas per year. Last year, Charlie consumed 20 bushels of apples and 5 bushels of bananas. It happens that the set of consumption bundles (X,Y) such that Charlie is indifferent between (X,Y) and $(20,5)$ is the set of all bundles such that $Y=100/X$. The set of bundles (X,Y) such that Charlie is just indifferent between (X,Y) and the bundle $(10,15)$ is the set of bundles such that $Y=150/X$.

- On the graph paper, plot several points that lie on the indifference curve that passes through the point $(20,5)$ and sketch this curve, using blue ink. Do the same, using red ink, for the indifference curve passing through the point $(10,15)$.
- Use pencil to shade in the set of commodity bundles that Charlie prefers to the bundle $(10,15)$. Use blue ink to shade in the set of commodity bundles such that Charlie prefers $(20,5)$ to these bundles.
- Write down Charlie's utility function. $U = XY$.

For each of the following statements about Charlie's preferences, write TRUE or FALSE.

- $(30,5) \sim (10,15)$ $150 \text{ vs } 150 \Rightarrow \text{TRUE}$
- $(10,15) > (20,5)$ $150 \text{ vs } 100 \Rightarrow \text{TRUE}$
- $(20,5) \succeq (10,10)$ $100 \text{ vs } 100 \Rightarrow \text{TRUE}$
- $(24,4) \succeq (11,9.1)$ $96 \text{ vs } 100.1 \Rightarrow \text{FALSE}$
- $(11,14) > (2,49)$ $154 \text{ vs } 98 \Rightarrow \text{TRUE}$

- Find Charlie's MRS at the point $(10,10)$.
- What is Charlie's MRS at the point $(20,5)$?
- What is Charlie's MRS at the point $(5,20)$?

$$\left. \begin{array}{l} \text{MRS} = \frac{dY}{dX} \Rightarrow Y = \frac{U}{X} \text{ so } \frac{dY}{dX} = \\ -\frac{U}{X^2} = -\frac{XY}{X^2} = -\frac{Y}{X} \end{array} \right\} \begin{array}{l} \text{so i) } 1 \quad \text{j) } \frac{1}{4} \quad \text{k) } 4 \end{array}$$

l) Do the indifference curves that you have drawn for Charlie exhibit diminishing marginal rate of substitution?

YES As x increases & y decreases, the slope falls from 1 to $\frac{1}{4}$, so yes, MRS \downarrow .

2) Janet drinks beer each evening while watching TV. She doesn't care about the size of the cans the beer comes in, she only cares about how much beer she has.

- On graph paper, draw some of Janet's indifference curves between 16 ounce and 8 ounce cans of beer. Use blue ink to draw these indifference curves.
- Beatrice likes to have a beer while she watches "Masterpiece Theatre." She only allows herself an 8 ounce glass of beer at any one time. Since her cat doesn't like beer and she hates stale beer, if there is more than 8 ounces in the can she pours the excess into the sink. On same graph that you used in a) use red ink to draw some of Beatrice's indifference curves.

3) Coach Steroid likes his players to be big, fast and obedient. If player A is better than player B in two of these three characteristics, then Coach Steroid prefers A to B, but if B is better than A in two of these three characteristics, then Steroid prefers B to A. Otherwise, Steroid is indifferent between them. Wilbur Westinghouse weighs 240 pounds, runs very slowly and is fairly obedient. Harold Hotpoint weighs 240 pounds, runs very fast, and is very disobedient. Jerry Jacuzzi weighs 150 pounds, runs at average speed, and is extremely obedient.

- a) Does Steroid prefer Westinghouse to Hotpoint or vs. Versa?
- b) Does Steroid prefer Hotpoint to Jacuzzi or vs. Versa?
- c) Does Steroid prefer Westinghouse to Jacuzzi or vs. Versa?
- d) Does Coach Steroid have transitive preferences?

After losing several seasons, Coach Steroid decides to change his way of judging players. According to his new preferences, Steroid prefers player A to player B if player A is better in all three of the characteristics that Steroid values, and he prefers B to A if player B is better at all three things. He is indifferent between A and B if they weigh the same, are equally fast, and are equally obedient. In all other cases, Coach Steroid simply says "A and B are not comparable."

- e) Are Coach Steroid's preferences complete?
- f) Are Coach Steroid's new preferences transitive

4) Professor Jones gives two midterms in his communications class and calculates the course grade using the higher of the two scores that a student gets on his midterms.

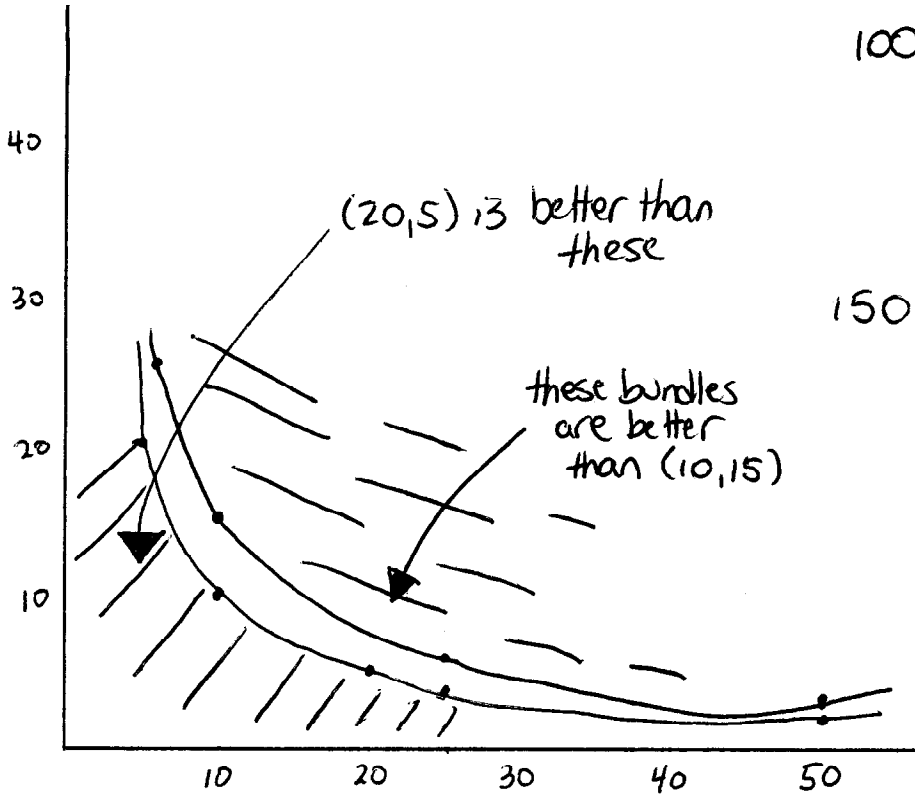
- a) Nancy wants to maximize her grade in this course. Let X be her score on the first midterm and Y be her score on the second midterm. Which combination of scores would Nancy prefer?
X=20 and Y=70 OR X=60 and Y=50
- b) On graph paper, use red ink to draw an indifference curve showing all of the combinations of scores that Nancy likes exactly as much as X=20 and Y=70. Also using red ink, draw another indifference curve showing the combinations that Nancy likes exactly as much as X=60 and Y=50.
- c) Nancy is also taking a course in economics from Professor Stern. Professor Stern gives two midterms. Instead of discarding the lower grade, Prof Stern discards the higher one. Which combination of scores would Nancy prefer now?
- d) On the same graph, use blue ink to draw an indifference curve showing all of the combinations of scores on her econ exams that Nancy likes exactly as well as X=20 and Y=70. Also use blue ink to draw an indifference curve showing the combinations that Nancy likes exactly as well as X=60 and Y=50.

5) Joe has a utility function given by $U(X,Y) = X^2 + 2XY + Y^2$. Compute Joe's MRS.

6) Al has a utility function $V(X,Y) = X+Y$. Compute Al's MRS.

7) Sally has a utility function $u(X,Y) = (X+a)(Y+b)$, where a and b are constants. Calculate Sally's MRS.

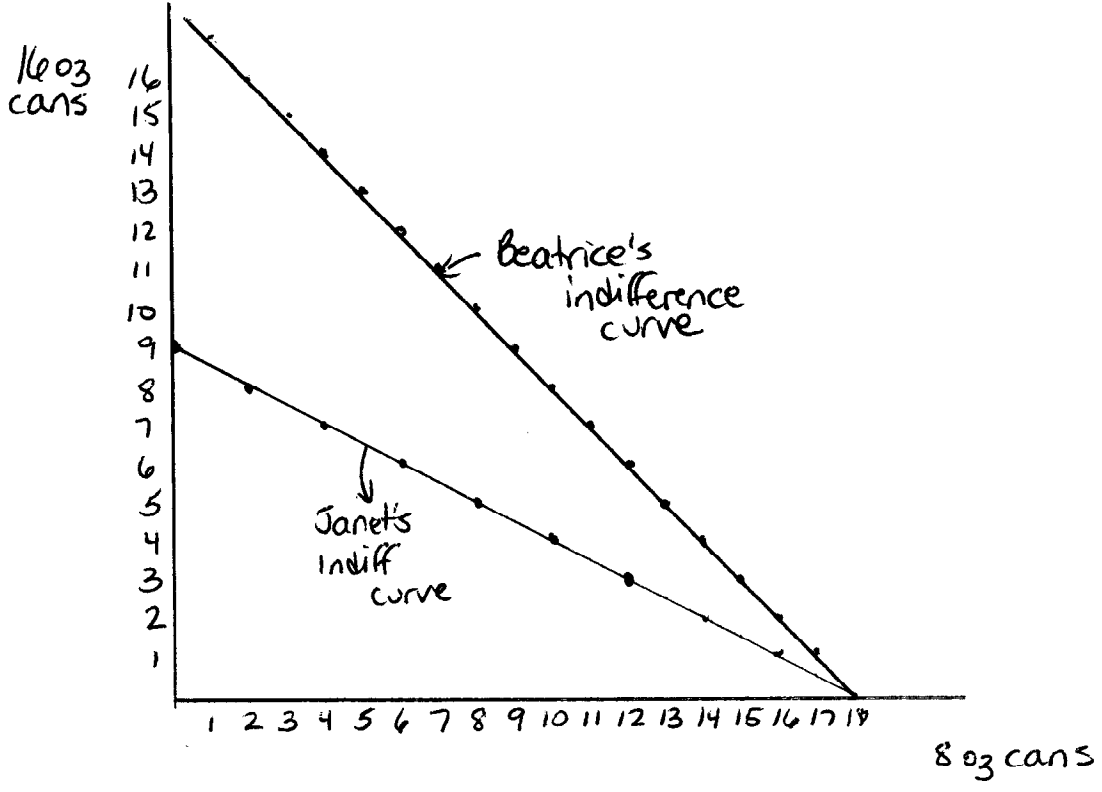
i)



100 = XY
 (20, 5)
 (5, 20)
 (4, 25)
 (10, 10)
 (50, 2)

150 = XY
 (10, 15)
 (6, 25)
 (50, 3)
 (25, 6)

2.



3) Wilbur is big, slow & obedient ^{sort of}
 Harold is big, fast & disobedient
 Jerry is small, med speed, very obedient

a) $W \sim H$

b) $H \succ J$

c) $J \succ W$

d) No - because if transitive, then $H \succ W$.

~~every coach steroid can rank his preferences~~

e) No - Coach Steroid must be able to rank his pref s. ^{to be complete}

f) No

4 a) $U = \max\{X, Y\}$

$$\text{so } U(20, 70) = 70$$

$$U(60, 50) = 60$$

$$\text{so } (20, 70) \succ (60, 50)$$

b) see graph

c) $U = \min\{X, Y\}$

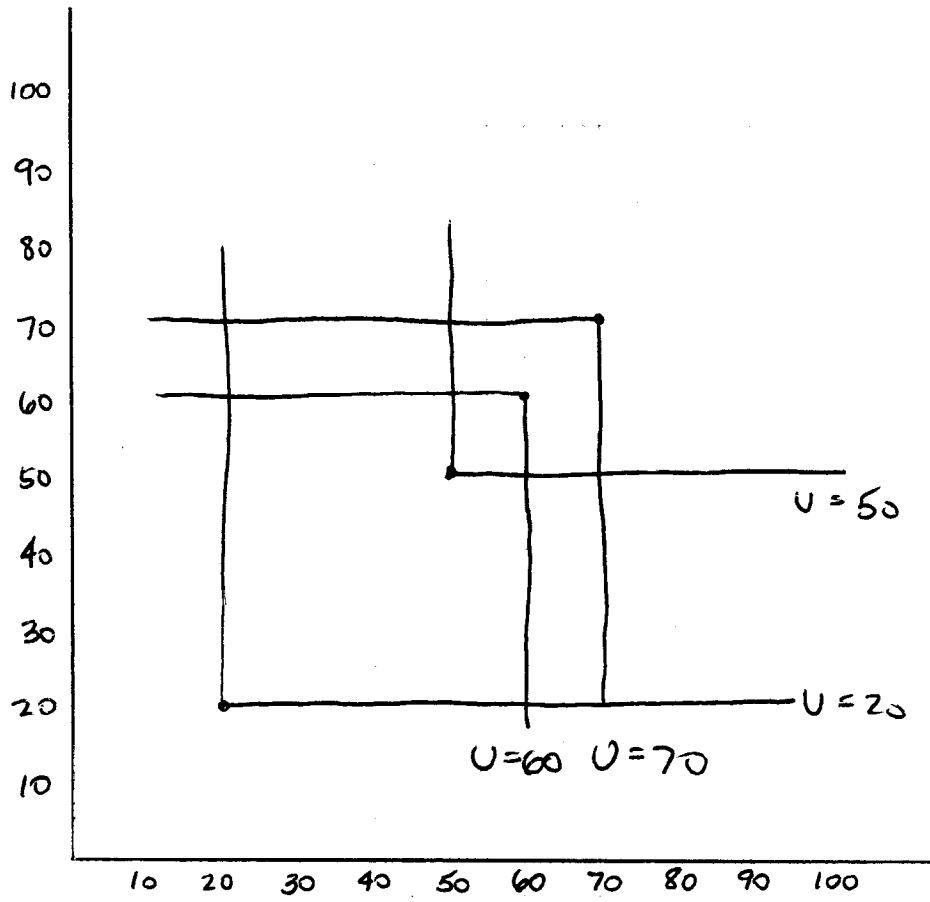
$$\text{so } U(20, 70) = 20$$

$$U(60, 50) = 50$$

$$\text{Now } (20, 70) \prec (60, 50)$$

d) see graph

4)



$$5) \quad U = x^2 + 2xy + y^2$$

$$dU = 0 = 2x dx + 2y dx + 2x dy + 2y dy$$

$$= 2(x+y) dx + 2(x+y) dy$$

$$-2(x+y) dx = 2(x+y) dy$$

$$\frac{dy}{dx} = -1$$

$$6) \quad U = x + y$$

$$y = U - x$$

$$\frac{dy}{dx} = -1$$

$$7) \quad U = (x+a)(y+b)$$

$$U = xy + ay + bx + ab$$

$$dU = 0 = y dx + b dx + a dy + x dy$$

$$= (y+b) dx + (a+x) dy$$

$$-(y+b) dx = (a+x) dy$$

$$\frac{dy}{dx} = \frac{-(y+b)}{(a+x)}$$