

Fall 2018 14.01 Problem Set 1

1 Positive vs. Normative Statements (16 points)

Identify whether each of the following statements is positive or normative. Briefly justify your answer.

1. (4 points) The government has a duty to provide basic healthcare and education to every citizen.
2. (4 points) The cost of health insurance is too high.
3. (4 points) The median earnings of a full-time worker with a college degree are almost twice as high as those of a high-school graduate with no college education.
4. (4 points) The current unemployment rate is 3.9%, the lowest it has been since December 2000.

2 True or False (20 points)

For each of the following statements, indicate if they are True or False. Justify your answer.

1. Bill is a football coach. He evaluates his players based on three criteria: height, strength, and speed. Bill prefers one player over another if he is better in at least two of these criteria. Assume that there are no players with the exact same height, nor the exact same strength, nor the exact same speed.
 - (a) (4 points) Bill's preferences are complete.
 - (b) (4 points) Bill's preferences are transitive.

2. (4 points) Ann and Bob are utility maximizing consumers. Given their income and market prices, Ann chooses a bundle that gives her a utility $U_{Ann} = 100$, while Bob chooses a bundle that gives him a utility $U_{Bob} = 110$. Therefore, we know that Bob is happier than Ann.
3. (4 points) John's utility function for food (f) and clothes (c) is given by $U(f, c) = (f^\alpha + c^\alpha)^{\frac{1}{\alpha}}$, with $\alpha > 0$. John's preferences satisfy the principle of diminishing marginal rate of substitution for any value of α .
4. (4 points) Ava has preferences over two goods that satisfy completeness, transitivity, non-satiation and the indifference curves have a strictly diminishing marginal rate of substitution. Suppose that the price of one of these goods increases (and the price of the other one remains the same). Claim: Ava's utility must be strictly lower after the price increase. How does your answer depend on the composition of the initial consumption bundle?

3 Demand for Video Games (16 points)

We have the following weekly demand data for the video game *Grand Theft Auto* in a US town. We also have the price data for a Playstation at the same time.

Price of Playstation (in \$)	Price of Grand Theft Auto (in \$)	Quantity of games demanded
300	10	100
310	10	95
320	10	90
300	11	99
310	9	96

1. (6 points) Write down the equation for the demand for *Grand Theft Auto* in the following form:

$$Q_g^D = \alpha + \beta_g P_g + \beta_p P_p$$

where Q_g^D and P_g are quantity demanded and price of *Grand Theft Auto*, P_p is the price of Playstation, and α, β_g, β_p are constants.

2. (4 points) Does the demand function that you found in part (1) satisfy the law of demand? Explain.
3. (6 points) The supply curve for *Grand Theft Auto* in this town is

$$Q_g^S = 2P_g$$

Solve for the equilibrium price and quantity, as a function of P_p . How does the equilibrium price and quantity depend on P_p ? Briefly explain the intuition.

4 Indifference Curves (18 points)

In each of the following examples, the consumer consumes only two goods, x and y . Based on the information given in each statement, sketch a plausible set of indifference curves (draw at least two curves on a set of labeled axes and indicate the direction of higher utility). Then, write down a possible form of the utility function $u(x, y)$ that is consistent with your graph.

1. (6 points) Alan likes wearing both right shoes (x) and left shoes (y). He always needs to wear them as a pair, having a right shoe is useless without the left one and viceversa.
2. (6 points) Emma likes pizza (x) but hates vegetables (y). She is only willing to eat an extra unit of vegetables if she gets to eat an extra unit of pizza.
3. (6 points) Mary likes Coke (x) and Pepsi (y). She is indifferent between them as she is unable to tell the difference between Coke and Pepsi.

5 Utility Maximization (30 points)

Chloe consumes only books (x) and video games (y). Her preferences can be represented by the following utility function: $U(x, y) = xy^2$. The price of books is p_x , the price of video games is p_y , and Chloe has an income of m dollars.

1. (4 points) Write down Chloe's budget constraint.
2. (4 points) Calculate the Marginal Rate of Substitution (at an arbitrary bundle (x, y)).
3. (6 points) Find the equations that describe Chloe's demand for books and her demand for videogames for any possible value of p_x, p_y and m .
4. (6 points) Repeat part 3 when the utility function is $U(x, y) = \min\{x, y\}$.
5. (4 points) Let us now go back to the original utility function $U(x, y) = xy^2$. Suppose that the government imposes a tax on videogames, such that if the price of a videogame is p_y , the consumer must pay $(1 + \tau)p_y$. What is the new demand function for videogames? Plot the demand before the tax and after the tax in the same graph (you don't need to assume any particular values for m, τ , it is enough to provide a qualitative graph). Briefly explain the intuition.
6. (6 points) Let's go back to the case without taxes. Suppose that $p_x = 2, p_y = 2, m = 30$. Suppose that Chloe has one "buy-10-get-10-free" coupon for books (that is, she will get 10 free books if she buys at least 10 books). How many books

and how many videogames will Chloe consume? Carefully draw the budget set and the highest attainable indifference curve on the same graph.

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