

## Homework Set #1 (Due Date: April 4th, 2025)

BTM 210, Microeconomics, Spring 2025

1. (PR 1.2) The following table shows the average retail price of butter and the Consumer Price Index from 1980 to 2000, scaled so that the CPI = 100 in 1980.

	1980	1990	2000	2010
CPI	100	158.56	208.98	218.06
Retail price of butter (salted, Grade AA, per lb.)	\$1.88	\$1.99	\$2.52	\$2.88

- Calculate the real price of butter in 1980 dollars. Has the real price increased/decreased/stayed the same from 1980 to 2000? From 1980 to 2010?
  - What is the percentage change in the real price (1980 dollars) from 1980 to 2000? From 1980 to 2010?
  - Convert the CPI into 1990 = 100 and determine the real price of butter in 1990 dollars.
  - What is the percentage change in real price (1990 dollars) from 1980 to 2000? Compare this with your answer in (b). What do you notice? Explain.
2. (PR 2.2) Consider a competitive market for which the quantities demanded and supplied (per year) at various prices are given as follows:

PRICE (DOLLARS)	DEMAND (MILLIONS)	SUPPLY (MILLIONS)
60	22	14
80	20	16
100	18	18
120	16	20

- Calculate the price elasticity of demand when the price is \$80 and when the price is \$100.
- Calculate the price elasticity of supply when the price is \$80 and when the price is \$100.
- What are the equilibrium price and quantity?
- Suppose the government sets a price ceiling of \$80. Will there be a shortage, and if so, how large will it be?

3. (PR 2.12) The table below shows the retail price and sales for instant coffee and roasted coffee for 1997 and 1998.

YEAR	RETAIL PRICE OF INSTANT COFFEE (\$/LB)	SALES OF INSTANT COFFEE (MILLION LBS)	RETAIL PRICE OF ROASTED COFFEE (\$/LB)	SALES OF ROASTED COFFEE (MILLION LBS)
Year 1	10.35	75	4.11	820
Year 2	10.48	70	3.76	850

- Using these data alone, estimate the short-run price elasticity of demand for roasted coffee. Derive a linear demand curve for roasted coffee.
  - Now estimate the short-run price elasticity of demand for instant coffee. Derive a linear demand curve for instant coffee.
  - Which coffee has the higher short-run price elasticity of demand? Why do you think this is the case?
4. (PR 3.2) Draw indifference curves that represent the following individuals' preferences for hamburgers and soft drinks. Indicate the direction in which the individuals' satisfaction (or utility) is increasing.
- Joe has convex indifference curves and dislikes both hamburgers and soft drinks.
  - Jane loves hamburgers and dislikes soft drinks. If she is served a soft drink, she will pour it down the drain rather than drink it. (Hint: Soft drinks neither increase nor decrease her utility.)
  - Bob loves hamburgers and dislikes soft drinks. If he is served a soft drink, he will drink it to be polite.
  - Molly loves hamburgers and soft drinks but insists on consuming exactly one soft drink for every two hamburgers that she eats.
5. (PR 3.5) Suppose that Bridget and Erin spend their incomes on two goods: food (F) and clothing (C). Bridget's preferences are represented by the utility function  $U(F, C) = 10 * FC$ , while Erin's preferences are represented by the utility function  $U(F, C) = 0.2 * F^2 C^2$ .
- With food on the horizontal axis and clothing on the vertical axis, identify on a graph the set of points that give Bridget the same level of utility as the bundle (10, 5). Do the same for Erin on a separate graph.
  - On the same two graphs, identify the set of bundles that give Bridget and Erin the same level of utility as the bundle (15, 8).
  - Do you think Bridget and Erin have the same preferences or different preferences? Explain.

6. (PR 3.10) Antonio buys five new college textbooks during his first year at school at a cost of \$80 each. Used books cost only \$50 each. When the bookstore announces that there will be a 10 percent increase in the price of new books and a 5 percent increase in the price of used books, Antonio's father offers him \$40 extra.

- a. What happens to Antonio's budget line? Illustrate the change with new books on the vertical axis.
- b. Is Antonio worse or better off after the price change? Explain.

7. (PR 4.7) The director of a theater company in a small college town is considering changing the way he prices tickets. He has hired an economic consulting firm to estimate the demand for tickets. The firm has classified people who go to the theater into two groups and has come up with two demand functions. The demand curves for the general public ( $Q_{GP}$ ) and students ( $Q_S$ ) are given below:

$$Q_{GP} = 500 - 5P$$

$$Q_S = 200 - 4P$$

- a. Graph the two demand curves on one graph, with P on the vertical axis and Q on the horizontal axis. If the current price of tickets is \$35, identify the quantity demanded by each group.
- b. Find the price elasticity of demand for each group at the current price and quantity.
- c. Is the director maximizing the revenue he collects from ticket sales by charging \$35 for each ticket? Explain.
- d. What price should he charge each group if he wants to maximize revenue collected from ticket sales?

8. (PR 4A.2) Show that the two utility functions given below generate the identical demand functions for goods X and Y:

$$a. U(X, Y) = \log X + \log Y$$

$$b. U(X, Y) = X^{0.5}Y^{0.5}$$

(Hint: Use the method of Lagrange multipliers to show their demand functions are identical.)

9. (PR 5.1) Consider a lottery with three possible outcomes:

- \$125 with probability 0.2     • \$100 with probability 0.3     • \$50 with probability 0.5

- a. What is the expected value of the lottery?
- b. What is the variance of the outcomes?
- c. What would a risk-neutral person pay to play the lottery?

- 10.** (PR 5.7) Suppose that two investments have the same three payoffs, but the probability associated with each payoff differs, as illustrated in the table below:

PAYOFF	PROBABILITY (INVESTMENT A)	PROBABILITY (INVESTMENT B)
\$300	0.10	0.30
\$250	0.80	0.40
\$200	0.10	0.30

- Find the expected return and standard deviation of each investment.
- Jill has the utility function  $U = 5I$ , where  $I$  denotes the payoff. Which investment will she choose?
- Ken has the utility function  $U = 5\sqrt{I}$ . Which investment will he choose?
- Laura has the utility function  $U = 5I^2$ . Which investment will she choose?