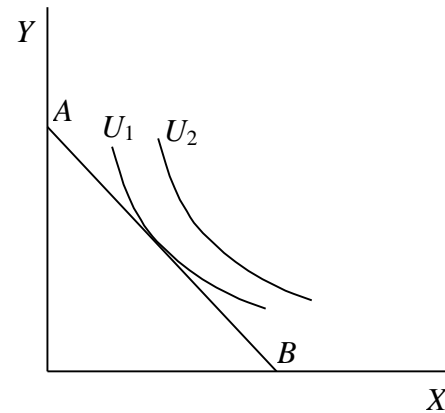


Problem Set #1
Due January 26, 2000

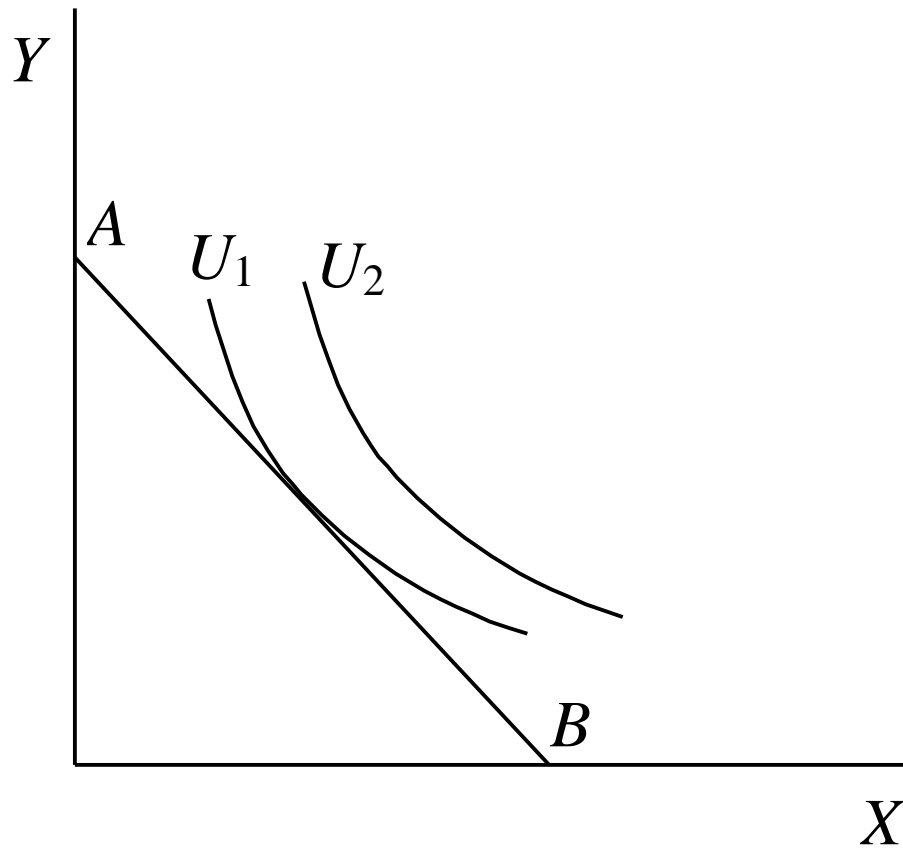
Answer all questions on these sheets, adding extra sheets if necessary.

1. The figure at the right shows the budget line, AB , and an initial indifference curve, U_1 , for a consumer who chooses between goods X and Y , where good Y is an aggregate of all of the other goods that he or she might consume. A second indifference curve, labeled U_2 , is also shown. A magnified version of the figure is reproduced on the next page, where you should show your answers.



Letting the price of good Y be $p_Y=1$, the price of good X be p_X , and the consumer's income be I ,

- Label the two intercepts of the budget line.
- Identify in the figure the initial levels of consumption at these prices of goods X and Y : C_X and C_Y .
- Suppose now that the price of good X changes to p_X' , income and the price of good Y remaining unchanged, and that the price change is just the right amount for the consumer to choose consumption on indifference curve U_2 . Add to the figure the new budget line that prevails after the price change, label its intercepts, and show the new levels of consumption of both goods: C_X' and C_Y' .
- Did the price of X rise or fall in part (c)?
- Is the elasticity of demand for good X by this consumer larger or smaller than one?
- Find in the figure the change in income that would have been exactly equivalent to this price change, in the sense that the consumer's well being would have been exactly the same if they have gotten that instead of the price change. Label it "EV." (This is the "equivalent variation.")
- Find in the figure the change in income that, if it accompanied the price change, would leave the consumer exactly as well off as they were before. Label it "CV." (This is the "compensating variation.")



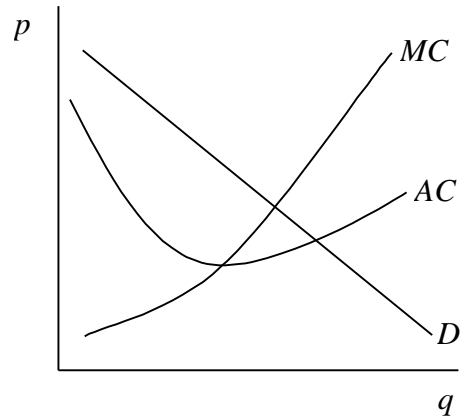
d) The price of X (circle one):

rose fell remained unchanged

e) The elasticity of demand for good X is (circle one):

larger than one smaller than one equal to one

2. The figure at the right, reproduced in magnified form on the next page where you should show your answers, shows the industry demand curve for a good, together with the industry marginal and average cost curves that prevail for a certain number of identical, profit-maximizing firms, n .

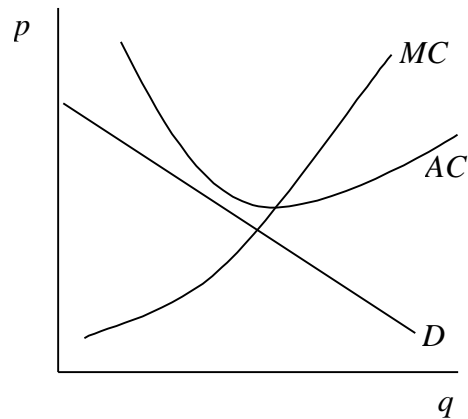
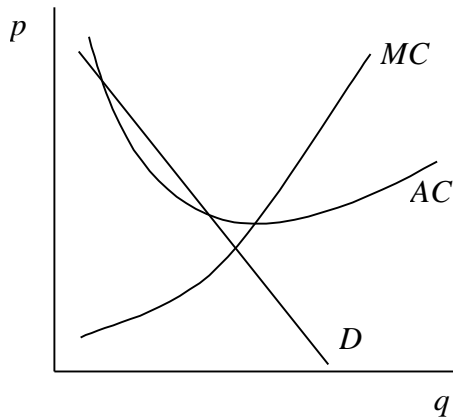


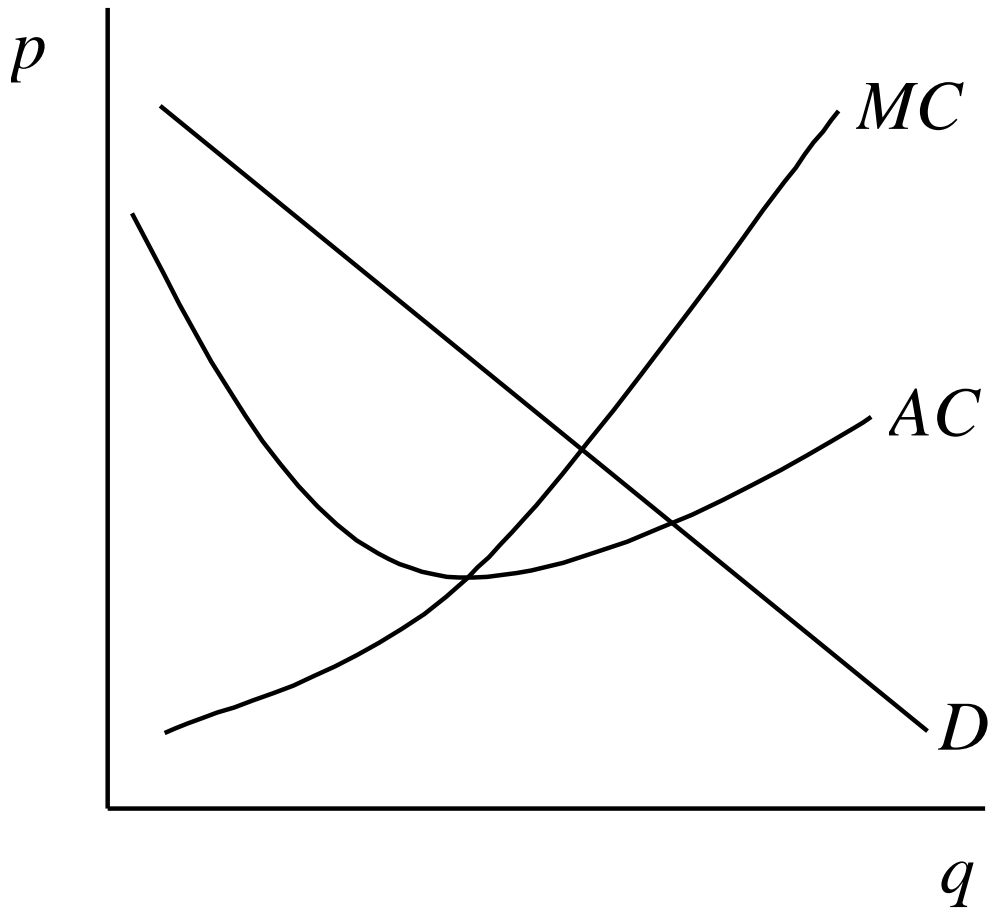
- a. If n is large and fixed, find the equilibrium price and quantity and label them p_1 and q_1 . Identify also the profit per unit earned by these firms in that equilibrium, and label it p_1 .
- b. If n is fixed at one ($n=1$), find the equilibrium price and quantity and label them p_2 and q_2 . Identify also the profit per unit earned by this firm in that equilibrium, and label it p_2 .
- c. If n is large and variable, with free entry and exit, find the equilibrium price and quantity and label them p_3 and q_3 . Identify also the profit per unit earned by the industry in that equilibrium, and label it p_3 .
- d. If n is fixed at two ($n=2$), without doing any formal analysis, write a sentence or two saying what you know about the equilibrium.

Again without doing any formal analysis, state how your answers to parts (a), (b), and (c) would have been different if the curves in the figure above had instead looked like each of those below.

e.

f.





d.

e.

f.

4. The rosebush industry has a supply curve of $S=2P-20$, where S is the daily production of rosebushes. Demand for rosebushes is given by $D=100-0.5P$.

a. What is the price per rosebush at equilibrium? How many rosebushes are produced daily at this equilibrium price?

b. Suppose a government study finds that the growing of rosebushes enhances the value of properties adjacent to rosebush farms by creating pleasant smells and scenic views; however, the pesticides needed to produce rosebushes contaminate groundwater and cause increased rates of various illnesses in those that drink it. The net result is a negative externality of an estimated \$45 per unit produced, so the government imposes a \$45 per-unit tax on rosebush production.

What is the new supply curve equation? What is the new equilibrium price and quantity, given the tax?

c. How much of the tax is paid by rosebush producers?