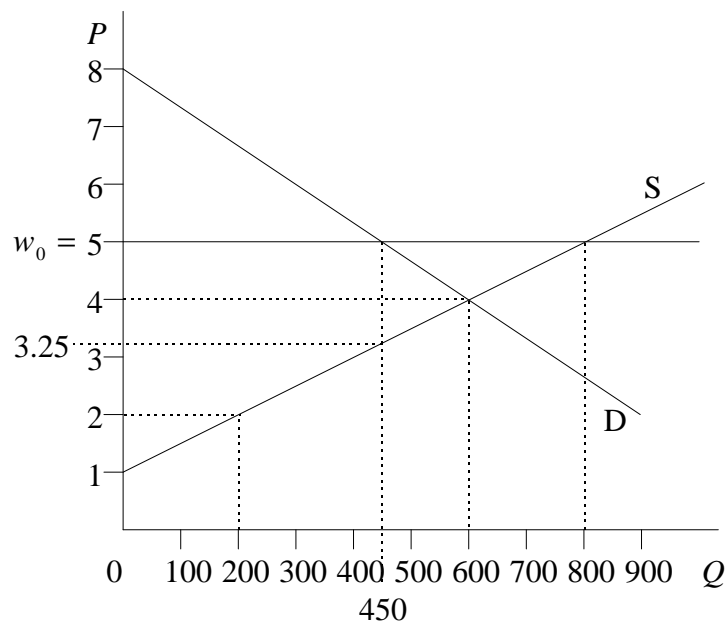


Problem Set #4
Due March 8, 2000

1. The figure below shows supply and demand in a labor market where a minimum wage is enforced at the level $w_0 = \$5.00$. Labor is measured by number of workers, and it is assumed that all employed workers have only one job, working standard hours. The upward sloping supply curve reflects the different willingness to work of different potential workers, worker No. 1 being willing to work at a wage of \$1, worker No. 200 at a wage of \$2, worker No. 800 at a wage of \$5, and so forth as indicated by the supply curve, S. Answer each of the questions below three times, once for each of the following mechanisms for allocating scarce jobs whenever there is excess supply of labor:
 - i) Random allocation among those willing to work
 - ii) Queuing, with all workers having the same cost per hour of waiting in line
 - iii) Bribery of hiring agents
- a) Identify, by their numbers and whatever words are necessary, which workers will be employed in the situation shown in the figure.
- b) Calculate the benefits and costs to all actual and potential workers in this market if the government now intervenes by hiring 150 workers in addition to whatever the private sector may demand.
- c) Calculate the effects, instead, of reducing the minimum wage from \$5.00 to \$4.00.



2. The Ann Arbor Arboretum (the Arb) is a large park that is currently available free to all users. At the zero price, users currently make 250,000 visits to the Arb each year. The city spends \$375,000 per year maintaining the Arb, of which \$125,000 is considered to be a fixed cost that would be needed regardless of the number of visits, and the rest is an estimated variable cost of \$1 per visit. It is believed that demand for visits to the Arb is linear, and that demand would be positive for any price per visit below \$5 but zero at prices of \$5 or higher.
- a) Calculate the total consumer surplus enjoyed by visitors to the Arb each year. How much is this per visit? How does it compare to the city's average cost per visit?
 - b) Suppose now that the Arb were turned over to a private firm that was allowed to charge admission to the park. Fixing the price of admission at the average cost per visit currently observed, what would be the *change in* consumer surplus and what would be the profit (or loss) of the firm?
 - c) If free to charge any price, what would the firm charge, and what would be the *level of* total consumer surplus and profit in that situation?
 - d) Suppose that, at the current price of zero, the 100,000 residents of Ann Arbor are in three groups: 45,000 are Couch Potatoes who never visit the Arb at all; 25,000 are Token Tree Huggers who visit it twice a year; and 30,000 are Nature Nuts who visit it five times a year. The remaining visits are by nonresidents who visit only once a year. All visitors to the Arb have linear demand curves that cross the price axis at \$5. (Visits are perfectly divisible, so that, for example, a nonresident facing a price of \$1 would visit 0.8 times a year.) What is the socially efficient price to charge each of these groups of visitors (society being defined as the world as a whole, not just Ann Arbor)?
 - e) Assuming that the current cost to the city of maintaining the Arb is shared equally among all 100,000 residents, what is the net benefit to each type of person of having the Arb (compared to closing it) and sharing the cost? Compared to this, how much would each type gain or lose if the Arb were privatized as in part (c)? Also compared to free admission, how much would each type gain or lose if the socially efficient price of part (d) were charged and costs were shared equally among Ann Arbor residents? Record your results in a table like that on the following page:

	Net Benefit if Free Admission	Gain from Privatization	Gain from Efficient Pricing
Couch Potatoes Token Tree Huggers Nature Nuts Nonresidents			

- f) What are the net benefits to Ann Arbor and to society as a whole of each of these options?
- g) Which of these options, if any, would be selected by majority voting?

3. Calculate the present discounted value of the projects listed in the table below, which reports for each of four projects, a, b, c, and d, the relevant interest rate, r, and the benefits (positive) and costs (negative) in the present (t=0), and each of t years from the present.

Project	Interest rate	Benefits (+) and Costs (-) in present (0) and future years, t=							
		0	1	2	3	4...9	10	11	12...∞
a)	5%	-700	300	400					
b)	3%	5	-5	-5	-5	-5	-5		
c)	7%	-200	14	14	14	14	14	14	14
d)	10%							100	100
e)	6%	-50	-50	-50	6	2*t	20	75	
f)	-2%	-1000	100	100	100	100	100		
g) x=1.03	4%		10x	10*x ²	10*x ³	10*x ^t	10*x ¹⁰	10*x ¹¹	10*x ^t
h)	1%		10	10	10	10	10	10	10