Health Economics - Homework 1

Question 1 must be answered online via Blackboard. Submit the answer to questions 2-8 on paper!

1. In this exercise you have to calculate the fixed annual growth rates for the different periods as well as fixed annual growth rates for the entire period and overall growth rates over the entire period. The specific questions are posted on Blackboard under Homework 1 - please answer this question online.

Year	NHE	GDP	Physician Services
1960	\$27.5	\$526	\$21.9
1970	\$74.9	\$1,039	\$34.5
1980	\$253.4	\$2,790	\$76.5
1990	\$714.0	\$5,803	\$160.8
2000	\$1,353.6	\$9,817	\$244.7
2005	\$1,980.6	\$12,422	\$287.5
2006	\$2,112.7	\$13,178	\$291.9
2007	\$2,241.2	\$13,808	–

(Numbers are in million dollars)

2. Graph the health production function

$$HS = F(HC, E, K, L) = 100 \times HC^{0.1} E^{0.25} K^{0.45} L^{0.2},$$

where HC is health care inputs measured in dollars, E are environmental inputs measured in dollars, K is capital, and L is labor. Graph the function $F(HC, E = 10, K = 5, L = 7)$ in a graphs with output on the vertical axis and health care on the horizontal axis. Graph the marginal product of health inputs. Is it increasing or decreasing? Show how the health production and the marginal curve change when E is increased to 15. Draw detailed graphs!

3. Demand and Supply Shifts:
Using a supply-and-demand graph and assuming competitive markets, show and explain the effect on equilibrium price and quantity of the following events:

   (a) A technological change that reduces the cost of producing cancer tests on the market for physician clinic services.

   (b) Increased graduations of new doctors on the market for physician services.

   (c) The virtual elimination of smoking in the population on the market for hospital services.

   (d) a price ceiling placed on physician fees in the market for physician services.

4. Draw a budget constraint with other goods (OG) and Food (F) on the axes. What is the intercept of the budget constraint with the OG-axis and the intercept with the F-axis.

   (a) Use a graph and write down the equation for the budget line.

   (b) Describe what happens if both income and all prices double. Explain how the budget constraint is affected. Draw the graph.

5. Consider the following demand function:

$$Q = 1500 - 1.5P.$$

Assume the initial price is $P = \$300$. Consider a price change of \$1 and calculate the demand price elasticity. Is demand elastic? Does your answer change if you calculate the elasticity by decreasing the price by one dollar or increasing it by one dollar?

6. Consider a project that costs $\$10,000$ today. It will provide benefits of $\$4,000$ at the end of Year 1, $\$3,500$ at the end of Year 2, and $\$3,500$ at the end of Year 3. If the discount rate is 6%, will this project be approved using cost-benefit analysis? Would your answer change if the discount rate is: (a) 5%, (b) 4%?

7. Demand and Supply and Total Surplus

$$\begin{aligned} p &= 10 - 3q, \\ p &= 3 + 2q. \end{aligned}$$

   (a) Calculate equilibrium prices and quantities, draw the demand and supply into a graph, then calculate consumer surplus (CS), producer surplus (PS), and total surplus (TS).

   (b) Now introduce a price ceiling of

$$p_c = \$3.5$$

   and calculate the new equilibrium price and quantity, and the new CS, PS, and TS. Draw a detailed graph! What happens to consumer and producer surplus compared to point (a)?

   (c) Now introduce a quota of $q = \frac{1}{2}$. How does the quota affect equilibrium prices. Calculate the new CS, PS, and TS of this economy. What happens to consumer surplus and producer surplus compared to point (a)?

8. Consider the following table of costs and benefits from a governmental policy to clean the water in a local area.

Level of Abatement	**Total Costs**	**Total Benefits**
0%	\$0	\$0
10%	\$10	\$80
20%	\$22	\$150
30%	\$40	\$200
40%	\$70	\$240
50%	\$105	\$280
60%	\$150	\$320
70%	\$210	\$350
80%	\$280	\$375
90%	\$350	\$385
100%	\$420	\$390

   (a) What level of abatement is most efficient by general economic criteria?

   (b) Would a 70 percent level of abatement pass a cost-benefit test? Is it efficient?

   (c) How would you respond to those who argue for 100 percent abatement?