

### Problem Set #3

**NOTE - If you are turning in this problem set for credit, you must turn in only the 2 "Solution Pages" which are included after this problem set.**

1. You are given the following schedules for the supply (QS) and demand (QD) of tesseracts, skyhooks, and widgets:

TESSERACTS			SKYHOOKS			WIDGETS		
Price	QS	QD	Price	QS	QD	Price	QS	QD
\$1.00	60	140	\$1.00	50	110	\$1.20	50	100
\$1.20	64	128	\$1.20	56	104	\$1.36	56	96
\$1.40	68	116	\$1.40	62	98	\$1.52	62	92
\$1.60	72	104	\$1.60	68	92	\$1.68	68	88
\$1.80	76	92	\$1.80	74	86	\$1.84	74	84
\$2.00	80	80	\$2.00	80	80	\$2.00	80	80
\$2.20	84	68	\$2.20	86	74	\$2.16	86	76
\$2.40	88	56	\$2.40	92	68	\$2.32	92	72
\$2.60	92	44	\$2.60	98	62	\$2.48	98	68
\$2.80	96	32	\$2.80	104	56	\$2.64	104	64
\$3.00	100	20	\$3.00	110	50	\$2.80	110	60

You will notice that each market is in equilibrium when  $P=\$2.00$ ,  $Q=80$ .

- Calculate the elasticities of supply (ES) and demand (ED) in each market when  $P=\$2.00$ ,  $Q=80$ . [Hint: pick an interval with  $P=\$2.00$ ,  $Q=80$  at its midpoint; make sure that you use  $P=\$2.00$  and  $Q=80$  as your values for  $P$  and  $Q$  in the elasticity formula.]
- In each market, the government levies on the sellers a tax of 80 cents ( $\$0.80$ ) for each unit sold. For each market, determine the new equilibrium price and determine the how much of the tax is borne by sellers (the sellers' share SS) and how much by buyers (the buyers' share BS).
- In each market, compute the following two ratios:
  - elasticity of demand divided by elasticity of supply;
  - sellers' share of the tax divided by buyers' share of the tax.

d) Fill in the blanks:

As demand becomes more elastic, more of a tax is borne by \_\_\_\_\_.

When supply is completely elastic, all of the tax is borne by \_\_\_\_\_.

When supply is completely inelastic, all of the tax is by \_\_\_\_\_.

When demand is completely inelastic, all of the tax is borne by \_\_\_\_\_.

2. The cost department of a firm has found that the firm employs 90 units of capital (fixed in the short run) and has the following short run production function:

Labour (hrs/day)	194	216	242	272	306
Output (per day)	80	90	100	110	120

The price of capital is \$7 per day and the price of labour is \$5 per hour. To answer the questions in this problem, you will need to construct two tables, which you will not be handing in, but parts of which you will be reporting. The first table will show, for each quantity of labour, the marginal product of labour (marginal product is computed between the various amounts of labour - that is, between 194 and 216 hours of labour, between 216 and 242 hours of labour, and so on; marginal product of labour is defined as the change in output divided by the change in labour). The second table will show, for each level of output, the total fixed cost, the total variable cost, the total cost, the average fixed cost, the average variable cost, the average cost, and the marginal cost (again computed between the various output levels, as between 80 and 90, between 90 and 100, and so on; marginal cost is defined as the change in cost divided by the change in output).

a) Fill in the values requested below from the first table:

Labour	194	216	242	272	306
Marginal Product of Labour	_____	_____	_____	_____	

This production function demonstrates "diminishing marginal productivity". Explain how we know that in 25 words or less.

b) Fill in the values requested from the second table:

Q	AVC	AFC	AC	MC
80	_____	_____	_____	_____
90	_____	_____	_____	_____
100	_____	_____	_____	_____
110	_____	_____	_____	_____
120	_____	_____	_____	_____

3. Assume the following cost information for a firm in a perfectly competitive industry:

Output	TVC	TFC	TC	AVC	AC
6	105	40	145	17.50	24.17
7	116	40	156	16.57	22.29
8	129	40	169	16.13	21.13
9	144	40	184	16.00	20.44
10	161	40	201	16.10	20.10
11	180	40	220	16.36	20.00
12	201	40	241	16.75	20.08
13	224	40	264	17.23	20.31
14	249	40	289	17.79	20.64
15	276	40	316	18.40	21.07
16	305	40	345	19.06	21.56
17	336	40	376	19.76	22.12
18	369	40	409	20.50	22.72

a) Suppose that the price is \$24. Determine the output that the firm will produce by filling in the missing values in the following table. Circle the level of output that the firm will produce. **For your own benefit** (do not turn it in for grading), draw a diagram showing AC, AVC, MC, P, MR, equilibrium output, and profit when the price is \$24.

Q	TR	TC	PROFIT	MC	MR
9	_____	\$184	_____	_____	_____
10	_____	\$201	_____	_____	_____
11	_____	\$220	_____	_____	_____
12	_____	\$241	_____	_____	_____
13	_____	\$264	_____	_____	_____
14	_____	\$289	_____	_____	_____
15	_____	\$316	_____	_____	_____

b) Insert the word "above", "below", or "equal to" in each of the following sentences:

- The firm should increase output if MC is \_\_\_\_\_ the price.
- The firm should decrease output if MC is \_\_\_\_\_ the price.
- The firm should leave output unchanged if MC is \_\_\_\_\_ the price.

c) Repeat part a (you will be provided with another shorter table to complete) when the price is \$18.