1. For the production function $f(L, K) = L + \sqrt{K}$, state and prove whether it has IRTS, DRTS or CRTS.

2. Suppose that a perfectly competitive firm has a long-run supply function $LTC(Q) = kQ^2$. Suppose also that the prevailing market price is $p$. For what values of $k$ and $p$ does this firm exit the market?

3. Suppose that the supply of the competitive fringe is given by $Q^f(p) = 10 + 2p$. Suppose that there is a dominant firm with a marginal cost $MC = 2$ and no fixed costs. The market demand function is given by $Q^M(p) = 100 - p$.

   (a) Find the profit maximizing price for the dominant firm, and its profit.
   (b) Find the monopoly price and its profits (that is, suppose the firm faces the whole market demand and there is no fringe) and compare it to the dominant firm's profit you get above. Which market structure is more socially desirable, dominant firm with a fringe or a monopoly? Why?
   (c) What happens to the dominant firm’s profit when the demand is more price elastic? Why?

4. In a two-period lived economy, one consumer wishes to buy a TV set in period 1. The consumer lives for two periods, and is willing to pay a maximum price of 100TL per period of TV usage. In period 2, two new consumers join the market, so they live in period 2 only. Each of the two new consumers is willing to pay a maximum of 50TL for using a TV in period 2. Suppose that there is only one firm producing TV sets, that TV sets are durable for two periods, and that the production is costless. Find the prices the monopoly charges for TV sets in periods 1 and 2.

5. What is the effect of used units on a durable good monopolist’s new unit price? What would happen to this effect if the monopolist could reduce the durability of the new units? And if the monopolist does so, what would happen to the availability of used units? Give an example of a real world practice along these lines.

6. Suppose there is a single firm, producing washing machines. The washing machines are durable for only two periods. The marginal cost is 30 with no fixed cost. The firm does not discount. There are 100 potential buyers in the first period. These buyers live for two periods and are willing to pay a maximum price of 100 TL for one period of washing machine usage. They have a discount factor of $\delta = 1/2$. In the second period, there are 300 many new buyers joining the market, and they live in the second period only (at the end of the second period everyone dies!). 100 of these new buyers are willing to pay 80TL and the rest are willing to pay 120 TL, for one period usage of washing machines. Also assume that the indifferences are resolved in favor of buying in the first period and that the consumers are strategic. Find the maximum overall profit the firm can achieve and the optimal prices it charges each period.
7. Suppose there is one single firm, Zenheizer, producing headphones. The headphones are durable for only two periods and the production is costless. Zenheizer does not discount. There are 200 many headphone buyers in period 1. These buyers live for two periods and are willing to pay a maximum price of 60TL per period of headphone usage. They have a discount factor of $\delta = 2/3$. In period 2, there are 500 many new headphone buyers join the market, so they live in period 2 only. Each of these 500 new buyers is willing to pay 90TL for one period usage of headphones. Also assume that the indifferences are resolved in favor of buying in the 1st period and that the consumers are strategic.

(a) Find the maximum overall profit Zenheizer can achieve.

(b) What if instead of 500 new buyers, only 300 new buyers join the market in the 2nd period?

8. Suppose there is one single firm producing refrigerators which are durable for only three periods and the production is costless. The firm does not discount. There are only 2 buyers. No new buyers join at any period. Both buyers live for three periods. One of the buyers has a willingness to pay of 12TL and the other buyer has a willingness to pay of 8TL, per period of refrigerator usage. Both buyers have a discount factor of $\delta = 1/2$. Also assume that the indifferences between buying and waiting are resolved in favor of buying and that the consumers are strategic. Each period the monopoly sets a price $P_t$ for $t = 1, 2, 3$ and then each buyer decides whether to buy or not (if hasn’t bought yet). Find the optimal prices for the monopoly.

9. Suppose there is a single firm, producing a durable good $X$, which is durable for only two periods. The marginal cost is zero and there are no fixed costs. The firm does not discount, that is, the firm’s discount factor is $\delta_f = 1$. There are 3 potential buyers, buyer $A$, buyer $B$ and buyer $C$. Buyer $A$’s valuation for one period usage of good $X$ is $v_A = 16$, and she has a discount factor $\delta_A = 0$. Buyer $B$’s valuation for one period usage of good $X$ is $v_B = 10$, and she has a discount factor $\delta_B = 1/2$. Buyer $C$’s valuation for one period usage of good $X$ is $v_C = 6$, and she has a discount factor $\delta_C = 1/2$. All buyers live for two periods and are demanding at most one unit of good $X$ in their entire life-time. Assume that the indifferences between buying now and waiting are resolved in favor of buying now and that the consumers are strategic. Suppose, at the beginning of period first period, the firm announces prices for each period, $P_1$ and $P_2$, and credibly commits to these prices. Find the maximum overall profit the firm can achieve and the optimal prices it announces for each period.