

Homework 22

due April 21, 2018

Submit homework before the beginning of the exam at your exam room. Submissions at any other time or manner will be ignored. Any paper which does not resemble work by a student of a world-class institution (not clean, illegible, unnamed, unstapled, unlabeled tasks, final results not in boxes etc.) will be penalized with up to 50 points at the discretion of the grader. Copying in homework will be penalized with a 0 in that assignment and a penalty of 10 points in the course homework average. Students who give their homework away for others to copy from will be penalized with 0 in that assignment and a penalty of 30 points in their course homework average. Repeated offenders will be receiving a permanent reprimand for unethical behavior in their public student records.

1. Consider a duopoly, where the inverse market demand is $P = 100 - Q$ and firms compete by setting quantities. Marginal costs of each firm are 20 and fixed costs are 0. Firm 1 has an opportunity to invest $20x^2$ in technology's development and reduce average costs by x . This technology can be protected by a patent for 20 years. The discount factor is 0.9. Find the optimal x and the NPV equilibrium profits. Round up your answers to the nearest whole number. [80p]

2. Consider a Bertrand duopoly with average costs equal to 65 and market demand $Q = 100 - P$. Imagine that firm 1 discovers a method that can lower the unit cost to 20 and immediately patents the innovation.
 - (a) What will be the equilibrium prices, quantities and profits? [20p]
 - (b) If the regulator forces firm 1 to license the patent for a royalty r . That is, anyone who will use the patented method will have to pay r per unit to firm 1. Find what r firm 1 will set? What are the equilibrium prices? [40p]
 - (c) Will your answer to part (b) change, if there are 3 firms in the market and firm 1 license the patent for a royalty r to both firms? [20p]

3. [Review task] A manufacturer produces a homogeneous good at constant unit cost c and sells to a single retailer at price w . The retailer resells the good to final consumers at price p and market demand is $q = D(P)$, with $D'(P) = \frac{\partial q}{\partial P} < 0$.
 - (a) What is the meaning of the following equation? [20p]

$$(w - cD'(P) + (p - w)D'(P) + D(P) = 0$$
 - (b) What is double marginalization? Explain mathematically and intuitively why in this setup double marginalization will create inefficiency? [20p]

From all of us at the IE team we wish you the best luck in your exams and the UoLs! No matter what you try in the future, we are sure that you can make it if you try hard enough. Follow your dreams and make them not-just-dreams. Good luck! <3

Estimated completion time: 80 min

Difficulty level (normalized to UoL standards): 1.5/5 2. 5/5 3. 3/5

Direct your homework questions to Valeriya Popova