

# Theory of the Firm, Fall 2016

## Problem Set 6

Rules: (1) Submission deadline is **November 7th at 9:00** in class or by e-mail (only typed solutions by e-mail). (2) Feel free to consult with your colleagues and any materials, but submit your own solutions. Have fun!

### Problem 6.1

Exercise 7.3\* (page 284)

### Problem 6.2

Consider the model of spacial differentiation on the circle with linear transportation costs. Remember (or verify following calculations in Section 7.1.2.1) that under the assumptions made in Tirole's book and in class, in equilibrium the number of firms is  $n^c = \sqrt{\frac{t}{f}}$ , whereas socially optimal number of firms is  $n^* = \frac{1}{2}\sqrt{\frac{t}{f}}$ . Suppose now that the decisions are made by a monopolist, who chooses a number stores (to allocate equidistantly along the circle) and price. Assume that the price must be such that all consumers purchase the good. Find the optimal number of stores for this monopolist and compare it to  $n^c$  and  $n^*$ .

### Problem 6.3

Consider the vertical differentiation model discussed in class. In particular, assume that a consumer purchases gets utility  $\theta s - p$ , where taste parameter  $\theta$  is distributed uniformly in  $[\underline{\theta}, \underline{\theta} + 1]$ ,  $s$  is the quality of the good she purchased and  $p$  is the price she paid. There are two firms who play two-stage game: at Stage 1 they simultaneously choose quality levels  $(s_1, s_2)$  such that  $s_i \in [\underline{s}, \bar{s}]$  and at Stage 2 they simultaneously choose prices  $(p_1, p_2)$ . In contrast to the model discussed in class, marginal cost is a linear function of quality, when firm  $i$  produces quality  $s_i$ , then the marginal cost is  $cs_i$ , where  $c = \underline{\theta} + \frac{1}{2}$ . As in class, assume that the parameter values are such that all consumers purchase exactly one good and both firms sell positive amounts.

- 1) Find equilibrium prices, quantities, and profits for arbitrary pair  $(s_1, s_2)$ , st  $s_2 > s_1$ . Which firm produces more? Which firm earns more profit?
- 2) Argue that in all pure strategy Nash equilibria, goods are maximally differentiated.