

## Homework 9

Due December 19, 2017

Homework will be collected at the end of the lecture on the day it is due. Submissions in any other time or manner will be ignored. The maximum score is 100. Unprofessionally looking papers or unnamed or unstapled sheets or improperly labelled questions or bad handwriting will result to a penalty up to 50% at the discretion of the grader. Plagiarism will be prosecuted and perpetrators will make me sad :(

1. Consider a linear city of length 1 and density  $S$ . In this city there already exist 3 firms.  $L$  is located to the left end of the city,  $R$  to the right end, and  $M$  exactly at the middle. Consumers face a transportation cost of  $tx$  for any distance  $x$  they travel on the line. Marginal cost of production for the good by any firm is  $c$ . If a new firm wants to enter, it has to pay an entry fee  $f$ .
  - (a) Find the equilibrium prices and profits for all 3 firms. [20p]
  - (b) Assume now that firm  $E$  wants to enter somewhere in the city. Where should it enter? [10p]
  - (c) Assume that  $E$  decided to enter equidistantly between  $L$  and  $M$ . Calculate the prices and profits of all 4 firms. [30p]
  - (d) Calculate the prices and profits of  $L$ ,  $E$ ,  $M$ ,  $R$  if they had all scattered equidistantly to each other along the line. [20p]
  - (e) Calculate the disadvantage of late entry for  $E$  and find when this could be sufficient to keep  $E$  out of the market. [10p]
  - (f) Which theoretical model is appropriate for the analysis of this problem? Explain why. [10p]
  
2. Consider a hyper-city of the shape of a convex regular symmetric icosahedron with edges of length 1, with one firm on each vertex. Transportation cost is  $tx$ , marginal cost is zero and density per face is 0.2. Find the price of each firm. [0p]

