## CLASS \#9

## EXTERNALITIES contd.

## Problem \#1

The private and social marginal costs functions are given by the following formulas: $\operatorname{MPC}(q)=2 q$, $\operatorname{MSC}(q)=1+3 q$, where $q$ stands for output quantity. The private and social marginal benefits functions are: $\operatorname{MPB}(q)=\operatorname{MSB}(q)=61-2 q$. Find the Pigouvian tax rate $(P T(q))$ eliminating inefficiency in this market.

## Problem \#2

A milk dairy is located in the neighborhood of the airport. The total revenue of the airport is $T R_{A}(A)=48 A$, while the total cost is $T C_{A}(A)=A^{2}$, where $A$ is the daily amount of landing airplanes. The total revenue of the dairy is $T R_{D}(C)=60 C$, while the total cost is $T C_{D}(C)=C^{2}+C^{*} A$, where $C$ is the amount of cows (in hundreds). Notice that the nearby localization of the airport causes negative externalities for the dairy.
a) How many cows would the dairy have and how many airplanes would be landing daily, if both enterprises maximized profits in absence of any legal restrictions concerning negative effects of the airport's activity on its surroundings? Find the total profits of both enterprises in this case. Assume there is no possibility of an agreement between the airport and the dairy concerning the number of landing airplanes.
b) Find the Pigouvian tax rate aiming at a correction of the erroneous market allocation described in point a). How many cows would then be kept by the dairy and how many airplanes would be landing? Find the total profits of both enterprises for this case (calculate the tax as $T(A)=\left(M S C\left(A_{\text {corr }}\right)-M C\left(A_{\text {corr }}\right)\right)(A$ $\left.-A_{\text {corr }}\right)$, where $A_{\text {corr }}$ is the daily number of landing airplanes following the correction of the erroneous allocation).
c) Assume that there exists a law that demands that the airport fully compensates the dairy's loss of profits caused by the negative externalities of the airport's activity. How many cows would then be kept by the dairy and how many airplanes would be landing? (the remaining conditions are as in point a)). Find the total profits of both enterprises.
d) (additional) Assume that both enterprises are able to agree on the number of landing airplanes. Find the compensation amount that the dairy should offer the airport in order to maximize its profits (provide the relevant calculations). How many cows would then be kept by the dairy and how many airplanes would be landing? Find the total profits of both enterprises.

