Assignment 2 (Due Mon. Oct. 4 at start of class, 10% per day late)

Feel free to use Excel or some other computer tool to organize your thoughts. However, make sure that if you use a computer tool that you print all cell formulas, etc. when you submit your answer.

**Question 1 (12 pts):** Note you may need to do an hour or so of research to answer this question if you are not familiar with the activities of the US government and Microsoft.

Using our class discussion and reading from the text (including the footnotes) on monopoly, consider the US government's past attempt to break Microsoft's monopoly in operating system and applications software. Describe the monopoly that Microsoft has in these markets. How do the government legal actions against Microsoft fit with the discussion here? Consider the 'remedies' mentioned in the text and discuss how these remedies might affect social surplus in this market. You do not need to make specific quantitative estimates.

**Question 2 (16 pts):** Consider the market for highway use where there are costs of operating and maintaining the highways, and demand for using the highway (i.e., driving). In addition to the costs above, there are also social costs that happen in the market (e.g., vehicle emissions, safety, etc.). Assume the demand function is \( q = 12 - 0.5p \). The marginal private cost is \( p = q \).

a) What is the initial equilibrium and social surplus?
b) If the marginal social costs are double the private costs at all quantities, what is society's willingness to pay to remove the social costs at the initial equilibrium?
c) What is the socially optimal equilibrium? At the socially optimal equilibrium, what tax would be needed to remove the social costs?
d) If a tax of $6 is implemented, what would be the net social benefit?

**Question 3 (12 pts):** Major externalities caused by automobile travel include traffic congestion, noise, exhaust emissions that contribute to urban air pollution, traffic accidents, and emissions of carbon dioxide (a “greenhouse” gas produced by combustion of carbon-based fuels such as gasoline). Economists emphasize that the most efficient strategy for controlling such externalities is to levy taxes on them directly. Where it is difficult or costly to tax externalities directly, however, another approach is to do so indirectly by taxing the *activities* that cause them. What activity should ideally be taxed in order to reduce the level of each of these externalities most efficiently? Discuss how easy or difficult it might be to tax each externality activity.
**Question 4 (10 pts):** The *Highway Capacity Manual* (a compilation of traffic engineering data and methods published by the Transportation Research Board) states that travel speed on urban expressways is related to vehicle volume by the expression

\[ S = 70 - 0.015 V \]

where \( S \) is speed in miles per hour, and \( V \) is the hourly flow of vehicles in each lane. Assume that auto operating costs are $0.12 per mile, the average auto carries 1.5 persons, and auto travelers value their travel time at $10.00 per person-hour.

a. Write an equation for the average cost per mile of travel for an individual automobile as a function of \( V \).

b. Derive an equation for the change in total costs for all automobiles using the highway (the marginal cost) when an additional vehicle enters the facility.

c. What is the cost imposed on other users by an additional vehicle, expressed as a function of \( V \)?