Economic Assessment of Public Projects
Problem Set 4 - 2005
Due Wednesday, October 19th in class

Notes: Please write out all of your assumptions and include printouts of representative 'cell formulas' if you use computer spreadsheets or models.

For all questions, Assume that all cash flows occur at the ends of time periods, other than immediate investments or purchases, which happen 'at time zero'.

Question 1 (15 pts)

The construction industry uses a variety of tools to perform measurements at sites. Some are relatively "low-tech" methods, and some are "high-tech" tools that give very precise results. For example, DGPS uses Global Positioning Satellites for very exact results.

Following is a table with data for 3 available measurement tools. The purchase price is how much each item costs. The setup time is how long it takes the tool to be prepared for a measurement at a given place. Measure time tells how long it takes for each measurement once the unit has been set up.

Cost Item	Theodolite	Robotic Station	DGPS
Purchase Price	$7,000	$36,000	$40,000
Setup time	10 mins	8 mins	9 mins
Measure time	6 mins	1 min	6 mins

Assumptions:

- Assume that to find a measurement, the unit needs to be setup first. A unit does not need to be setup again for additional measurements until it is moved to another location.
- Yearly maintenance and repair costs for each tool is about $1,200.
- The 2 workers each tool requires are a surveyor at $35/hour and an assistant at $10/hour.
- Assume discount rate is 15%, straight-line depreciation with no salvage value, tax rate is 40%.

a) Using the information above, which tool would be the most economically efficient to use for a 3-year project with 5,000 measurements made per year in 100 different places? [You can assume that 50 consecutive measurements are made in each of the 100 places.]

b) Does your choice of which tool to use change if the maintenance and repair costs double? Does your choice change if your workers are slow and times double?

Question 2 (10 pts): Do question 5-9 in the Clemen text.

Question 3 (15 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 total 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?