ECONOMICS 172A
Problem Set #1, Due Wednesday, January 17, 2007

Some ground rules for home works and exams:
Write your homework answers on the sheets supplied. If necessary, you can get new sheets on the class web site.

All homework and examination items are answered with a limitation on space and a word count. Limitations on the homework items are typical of those on examination items. Write the best answer that you can in the space available. Writing that is clear and readable will be rewarded. As much as possible write in sentences and paragraphs. In many cases you will know more than can fit within the space and word allowance. You decide which parts are most important to write down.

You should outline the answer for yourself before writing it out for us. It also helps to connect the text to the diagrams and equations, which you do by labeling points in the diagrams (for instance by A, B, C, ...) or labeling equations (for instance, *, **, *** , ...) and then referring to the labels at the proper point in the text. For instance, you might write, "From the initial equilibrium of supply and demand, point A in the figure, the increase in demand leads to a new equilibrium at point B." You should practice this technique.

1. Consider the hide-and-seek game with three doors. If the prize is in door one it is one dollar; if it is in door two it is two dollars; and if it is in door three it is three dollars.

   (a) The seeker’s problem is to maximize $V$ subject to $V \leq \min(x_1, 2x_2, 3x_3)$. In thirty words explain why this problem makes sense.

   (b) In seventy-five words or less, explain why in the solution we have $x_1 = 2x_2 = 3x_3$.

   (c) In thirty words and a few equations, explain why the solution is $x_1^* = 6/11$, $x_2^* = 3/11$, $x_3^* = 2/11$.

   (d) Write the problem as a problem in linear programming problem.
2. (a) Given the linear program (incidentally, the solution is \(x_1^* = 10, x_2^* = 0, x_3^* = 20\) and the value of the program is 30).

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\begin{align*}
\text{Maximize} & \quad x_1 + x_2 + x_3 \\
\text{subject to} & \quad x_1 + x_2 \leq 10 \\
\text{and} & \quad x_2 + x_3 \leq 20
\end{align*}
\]

Write the dual of the program.

(b) Using the diagrammatic approach, show that the solution in the dual is \(y_1^* = 1\) and \(y_2^* = 1\), and the value of the dual is 30.