Some ground rules for problem sets and exams: Many homework and examination items are answered with a limitation on space and words. Write the best answer that you can within the limits. Given the limits, you must decide which parts are most important to write down. You should outline the answer for yourself before writing it out for us, whether on homeworks or examinations. 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 the technique.

SOLUTIONS ECONOMICS 172B
Problem Set #1, due Wednesday, January 9, 2008

1. Consider the following modification of the hide-and-seek game discussed in class on Monday. If the prize is in door one it is one dollar; if it is in door two it is three dollars. Answer the questions below on a excel spreadsheet and print as a single page in portrait format with your name in the upper right hand corner.

(a) The seeker’s objective is to maximize $V$ subject to $V \leq \min(x_1, 3x_2)$. In fifty words or fewer explain why this objective might make sense.
Answer: The seeker is concerned about the worst case outcome. Perhaps she assumes that the hider knows her strategy or learns it through repeated play. She maximizes what she can expect to get in the worst case. (34 words).

(b) Write the seeker’s problem as a problem in linear programming and solve diagrammatically (using the drawing package in excel or similar). The answer is $V^* = .75$, $x_1^* = .75$, and $x_2^* = .25$.
Answer:

$$\begin{align*}
\text{Maximize } V \\
\text{subject to } V - x_1 &\leq 0 \\
V - 3x_2 &\leq 0 \\
x_1 + x_2 &\leq 1
\end{align*}$$

(c) Write the dual and show that its solution is $V_0^* = .75$, $y_1^* = .75$ and $y_2^* = .25$. In fifty words or fewer describe the relation between the dual and the problem facing the hider.

$$\begin{align*}
\text{Minimize } V' \\
\text{subject to } -y_1 + V' &\geq 0 \\
-3y_2 + V' &\geq 0 \\
y_1 + y_2 &\geq 1
\end{align*}$$

Answer: The hider is worried about his worst case. He thinks the seeker knows or will learn his strategy. He minimizes his payout in the worst case. (26 words)