BOSTON COLLEGE
Department of Economics
EC 316A Advanced Scientific Computation, Prof. Baum, Fall 2003

Problem Set 1
Due at classtime, Tuesday 16 Sep 2003

Problem sets should be your own work. Please hand in listings of any MATLAB programs used to generate the answers to these problems.

1. a. Consider the three–state Markov transition probability matrix

$$\begin{pmatrix} 0.7 & 0.0 & 0.3 \\ 0.0 & 0.4 & 0.6 \\ 0.6 & 0.0 & 0.4 \end{pmatrix}$$

Is this a stationary Markov chain? Why or why not? Explain.

b. Now consider the transition probability matrix

$$\begin{pmatrix} 0.7 & 0.0 & 0.3 \\ 0.0 & 0.4 & 0.6 \\ 0.5 & 0.5 & 0.0 \end{pmatrix}$$

Compute the steady–state distribution π of this Markov chain, and explain what each of the elements of that distribution imply.

2. The Cournot two–firm (duopoly) model presented in class (and on p. 35–36 of the text) considers firms with cost parameters 0.6 and 0.8 and resulting industry (total) output of 1.5284 units.

a. Compute the Cournot outputs for two firms with cost parameters 0.1 and 0.9. What happens to industry output? Discuss.

b. Compute the Cournot outputs for three firms with cost parameters 0.1, 0.5 and 0.9. What happens to industry output vis-a-vis the result of case (a)? Why would industry output be larger or smaller with three competing firms than with two? Discuss.

3. Compute the solution to the mine management problem (`demddp01`), followed by the statements needed to generate the expected trajectory of s:
`sinit=max(s); nyrs=15;`
`spath=ddpsimul(pstar,sinit,nyrs); spath'`
where the spath vector will give s for each period. Redo the model over this same 15–year horizon with the assumption that the state imposes a 20% extraction tax on each unit of output. How does this change the expected trajectory of the mine's contents? What is the tax revenue earned each year? The total revenue over the 15–year horizon? (Assume that the tax is paid at the end of the year based on last year's output).