Econ 525a (first half)
Fall 2012
Yale University
Prof. Tony Smith

PROBLEM SET #5

Answers to this problem set are due by the beginning of lecture on Monday, November 5. Please submit your answers, including computer code, by email to: `tony.smith@yale.edu`.

1. Write a program (in a language of your choosing) that uses Gauss-Hermite quadrature to compute $E[e^X]$, where $X \sim N(\mu, \sigma^2)$. Set $\mu = 1$ and $\sigma = 1, 2, 3$. How does your answer change as you vary the number of quadrature points from 2 to 10? (Note: You can check your numerical answer against the analytical formula $E[e^X] = e^{\mu+\sigma^2/2}$. To obtain the Gauss-Hermite weights and abscissas, you can use the program `gauher` in Chapter 4.5 of *Numerical Recipes*.)

2. The goal of this problem is to find a smooth approximation to the function v satisfying:

$$v(k) = \max_{k'} [U(f(k) - k') + \beta v(k')],$$

where the functions U and f are specified as in the first problem on Problem Set #1. Approximate v on an interval $[k_L, k_H]$ centered on the steady-state capital stock using a linear combination of Chebyshev polynomials. Specifically, set up a grid of n points on the interval $[k_L, k_H]$ according to the roots of the degree-n Chebyshev polynomial; guess on v at these grid points; maximize the right-hand side of Bellman's equation at each of the grid points, using Chebyshev interpolation to compute v off the grid; update v on the grid points; and continue iterating until the approximation to v converges.