Econ 561a
Spring 2010
Yale University
Prof. Tony Smith

HOMEWORK #2

1. Write a program (in a language of your choosing) that uses the golden section method to find the maximum of the function $f(x) = \log(x) - x$.

2. Write a program that uses the Newton-Raphson method to find the maximum of the function in the first problem. (Note that both the first and second derivatives of f can be computed analytically.) Starting from the same initial point, which method converges more quickly to the maximum (i.e., requires fewer iterations)?

3. Write a program that uses linear and cubic spline interpolation to approximate the function $f(x) = \log(x)$ on an equally-spaced grid of 20 points on the interval $[0.1, 1]$. Find the maximum error (in absolute value) for each interpolation scheme on this interval. (To find the maximum error, you can use the program that you wrote in the first problem!)

4. Write a program to solve the neoclassical growth model by iterating on the value function, but rather than restricting capital to a discrete grid as in the fourth problem on Homework #1, instead approximate the value function by a cubic spline. That is, pick a grid of points (centered on the steady-state capital stock) at which to keep track of the value function, but do not restrict choices for tomorrow's capital to this grid. When searching for the optimal choice for tomorrow's capital (i.e., the value of tomorrow's capital that maximizes the right-hand side of Bellman's equation, given the current value of capital), use cubic spline interpolation to compute the value function off the grid. Report results for both full depreciation and less-than-full depreciation. Compare your results to the analytical solution (for the case of full depreciation) and to the results that you found in the fourth problem of Homework #1.