Econ 525a Fall 2014 Yale University Prof. Tony Smith

PROBLEM SET #2

This problem set is due on September 26. You should submit copies of your code along with a brief description, perhaps in the form of graphs or tables, of your findings. You can use any programming language to complete the problems, but I encourage you to take this opportunity to get familiar with Fortran 90!

- 1. Use one-sided finite differences to compute an approximation to the first derivative of $g(p) \equiv 0.5p^{-0.5} + 0.5p^{-0.2}$ at p = 1.5. Let the increment ϵ in the finite differences range across all the values in the set $\{10^{-1}, 10^{-2}, \ldots, 10^{-10}\}$. For which value of ϵ is the approximate first derivative the most accurate?
- 2. Repeat the second problem using two-sided finite differences to approximate the first derivative.
- 3. Use bisection, the method of successive approximations, the secant method, and Newton's method to compute an estimate of p^* satisfying $g(p^*) = 0.75$ (where g is defined in the first problem). For each method, report how many iterations are required to compute an estimate \hat{p} satisfying $|g(\hat{p}) g(p^*)| < 10^{-8}$.
- 4. Repeat the third problem using Brent's method as described in Chapter 9.3 of *Numer-ical Recipes* (available online at: apps.nrbook.com/fortran/index.html).