

Math 226 / CS 255, Spring 2007

Computing Assignment

Write programs for carrying out the bisection method, Newton's method, and the secant method. They should apply to an arbitrary function f . In each case, the calling sequence should include a parameter M for the maximum number of steps, and the user should also be able to specify the accuracy desired. Test and compare these programs on the functions

$$\begin{aligned} &\exp(-x) - x^2, \\ &\tan^{-1}(x) - \frac{2x}{1+x^2}, \\ &\cos(3x) - \cos(7x), \\ &x^3 - \sinh(x) + 4x^2 + 6x + 9. \end{aligned}$$

Apply the secant method on the latter with 7 and 8 as starting points, then with 3 and 10.

Consider now the function

$$f(x) = (x-1)(x-2)\cdots(x-20),$$

known as Wilkinson polynomial. Try to determine what happens to the zero $r = 20$ when the function is altered to $f(x) - 10^{-8}x^{19}$. You may try to use the secant method in double precision.