2 ONE-DIMENSIONAL SEARCH METHODS

7.2 Let $f(x) = x^2 + 4\cos x$, $x \in \mathbb{R}$. We wish to find the minimizer x^* of over the interval [1,2].

a. Plot $f(x)$ versus x over the interval $[1, 2]$.

b. Use the golden section method to locate x^* to within an uncertainty of 0.2. Display all intermediate steps using a table:

Iteration k	a_k	b_k	$f(a_k)$	$f(b_k)$	New uncertainty interval

c. Repeat part b using the Fibonacci method, with $\varepsilon = 0.05$. Display all intermediate steps using a table:

Iteration k	ρ_k	a_k	b_k	$f(a_k)$	$f(b_k)$	New uncertainty interval

d. Apply Newton's method, using the same number of iterations as in part b, with $x^{(0)} = 1$.

7.7 Suppose that we have an efficient way of calculating exponentials. Based on this, use Newton's method to devise a method to approximate log(2) [where "log" is the natural logarithm function]. Use an initial point of $x^{(0)} = 1$, and perform two iterations.