

4. Root jumping

In some case where the function $f(x)$ is oscillating and has a number of roots, one may choose an initial guess close to a root. However, the guesses may jump and converge to some other root. For example for solving the equation $\sin x = 0$ if you choose $x_0 = 2.4\pi = (7.539822)$ as an initial guess, it converges to the root of $x = 0$ as shown in Table 4 and Figure 6. However, one may have chosen this as an initial guess to converge to $x = 2\pi = 6.2831853$.

Table 4 Root jumping in Newton-Raphson method.

Iteration Number	x_i	$f(x_i)$	$ \epsilon_a \%$
0	7.539822	0.951	—
1	4.462	-0.969	68.973
2	0.5499	0.5226	711.44
3	-0.06307	-0.06303	971.91
4	8.376×10^{-4}	8.375×10^{-5}	7.54×10^4
5	-1.95861×10^{-13}	-1.95861×10^{-13}	4.28×10^{10}

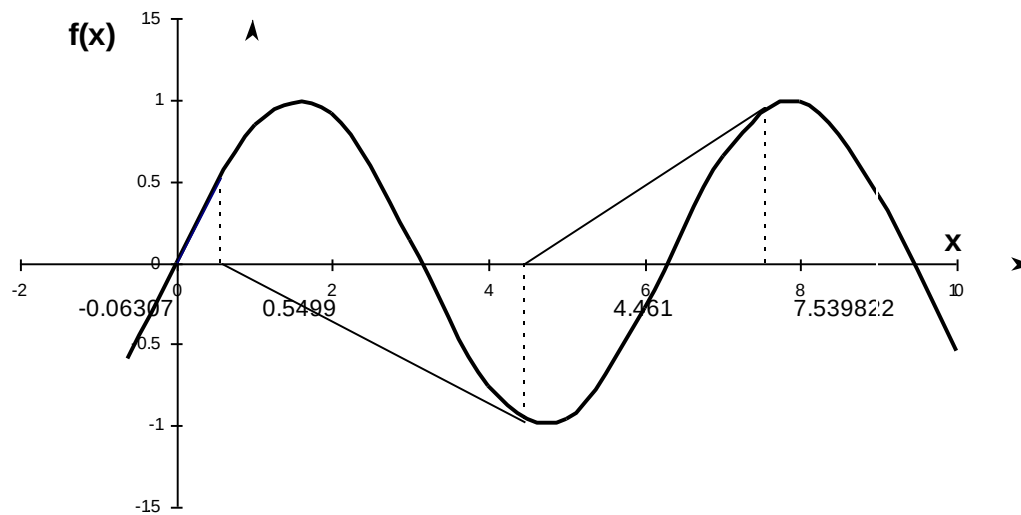


Figure 6 Root jumping from intended location of root for $f(x) = \sin x = 0$.