In a nutshell: The secant method

Given a continuous real-valued function f of a real variable with two initial approximations of a root x_{-1} and x_0 where $|f(x_{-1})| > |f(x_0)| > 0$, swapping them if $|f(x_0)| > |f(x_{-1})| > 0$. If they are equal, this algorithm will not work, and if one is zero, we have already found a root. This algorithm uses iteration, linear interpolation and solving a trivial linear equation to approximate a root.

Parameters:

$\varepsilon_{\text{step}}$	The maximum error in the value of the root cannot exceed this value.
ε_{abs}	The value of the function at the approximation of the root cannot exceed this value.
N	The maximum number of iterations.

1. Let $k \leftarrow 0$.
2. If $k > N$, we have iterated N times, so stop and return signalling a failure to converge.
3. If $|f(x_{k-1})| < |f(x_k)|$, swap these two values.
4. The next approximation to the root will be the root of the linear polynomial that interpolates the points $(x_{k-1}, f(x_{k-1}))$ and $(x_k, f(x_k))$.

   Let $x_{k+1} \leftarrow x_k - f(x_k)\dfrac{x_{k-1} - x_k}{f(x_{k-1}) - f(x_k)}$.

   a. If x_{k+1} is not a finite floating-point number, so return signalling a failure to converge.
   b. If $|x_{k+1} - x_k| < \varepsilon_{\text{step}}$ and $|f(x_{k+1})| < \varepsilon_{\text{abs}}$, return x_{k+1}.
5. Increment k and return to Step 2.

Convergence

If h is the error, it can be show that the error decreases according to $O(h^{\phi})$ where $\phi \approx 1.6180$ is the golden ratio (the positive root of $x^2 - x - 1 = 0$). This technique is not guaranteed to converge if there is a root, for the denominator could be arbitrarily small, causing the next approximation to be arbitrarily far from the previous approximation.