

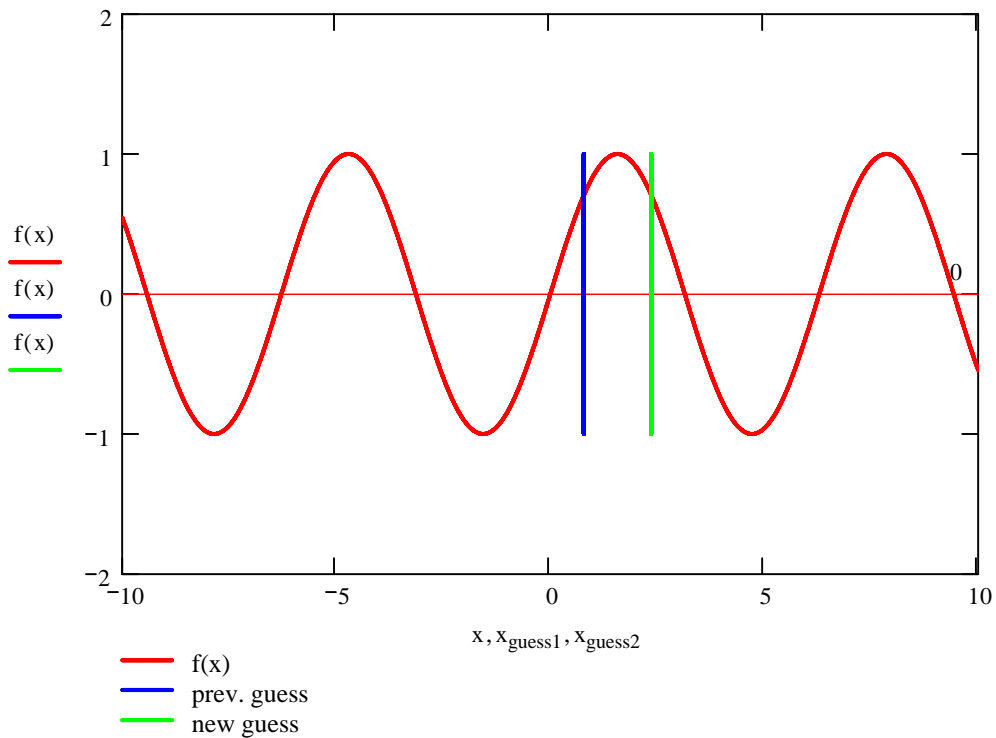
Topic : Secant Method - Roots of Equations
 Simulation : Pitfall - Root jumping several roots away
 Language : Mathcad 2001
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 Abstract : The following example illustrates how, in the Secant method, an initial guess close to one root can jump to a location several roots away.

INPUTS: Enter the following

Function in $f(x)=0$ $f(x) := \sin(x)$
Range of x you want to see the function $x := -10, -9.99.. 10$
First guess $x_{\text{guess1}} := \frac{\pi}{4}$
Second guess $x_{\text{guess2}} := 3 \frac{\pi}{4}$

SOLUTION:

Entered function at given interval



Iteration 1

Choose two initial guesses of the root.

$$x_{1'} := x_{\text{guess1}}$$

$$x_0 := x_{\text{guess2}}$$

Estimate of the root

$$x_1 := x_0 - \frac{f(x_0) \cdot (x_{1'} - x_0)}{f(x_{1'}) - f(x_0)}$$

$$x_1 = -1 \times 10^{16}$$

NOTE: This number actually is infinite because the secant line (being parallel with x-axis) never crosses the x-axis.

Secant line for the graph

$$m := \frac{f(x_0) - f(x_{1'})}{x_0 - x_{1'}}$$

$$\text{secant}(x) := m \cdot x + (f(x_0) - m \cdot x_0)$$

Entered function along given interval with current and next root and the tangent line of the curve at the current root

