Topic : Newton Raphson 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 Newton-Raphson 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** $f(x) := \sin(x)$

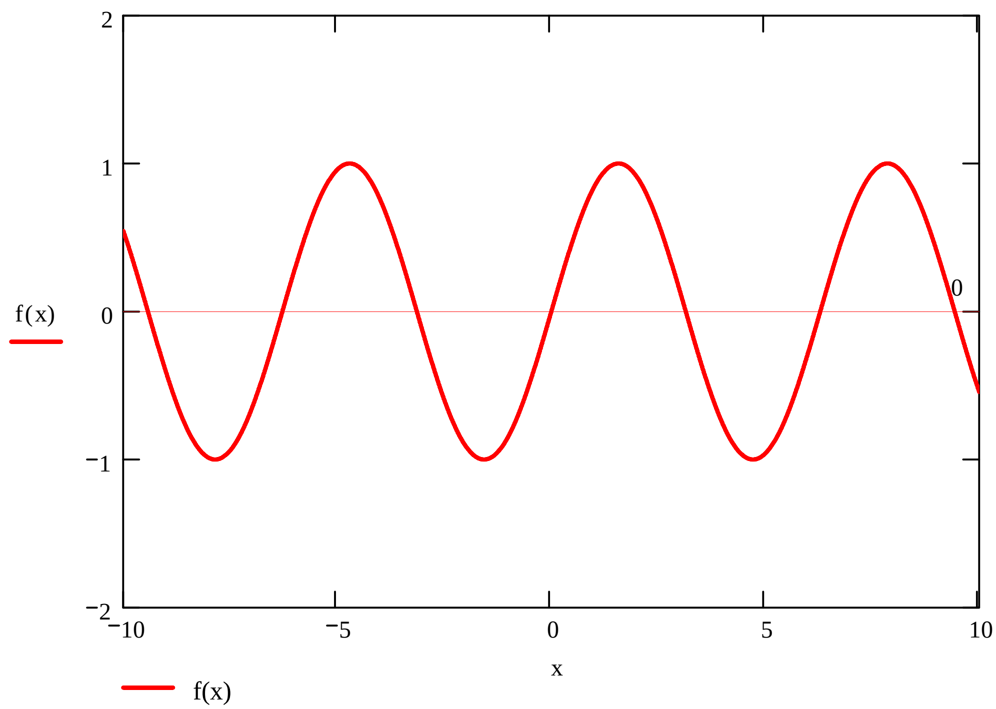
**Range of x you want to see the function** $x := -10, -9.99 .. 10$

**Initial guess** $x_{initial} := 1.431$

**SOLUTION:**

$$g(x) := \frac{d}{dx} f(x)$$

**Entered function at given interval**



**Iteration 1**

$x_0 := x_{initial}$

$x_0 = 1.431$

$$x_1 := x_0 - \frac{f(x_0)}{g(x_0)}$$

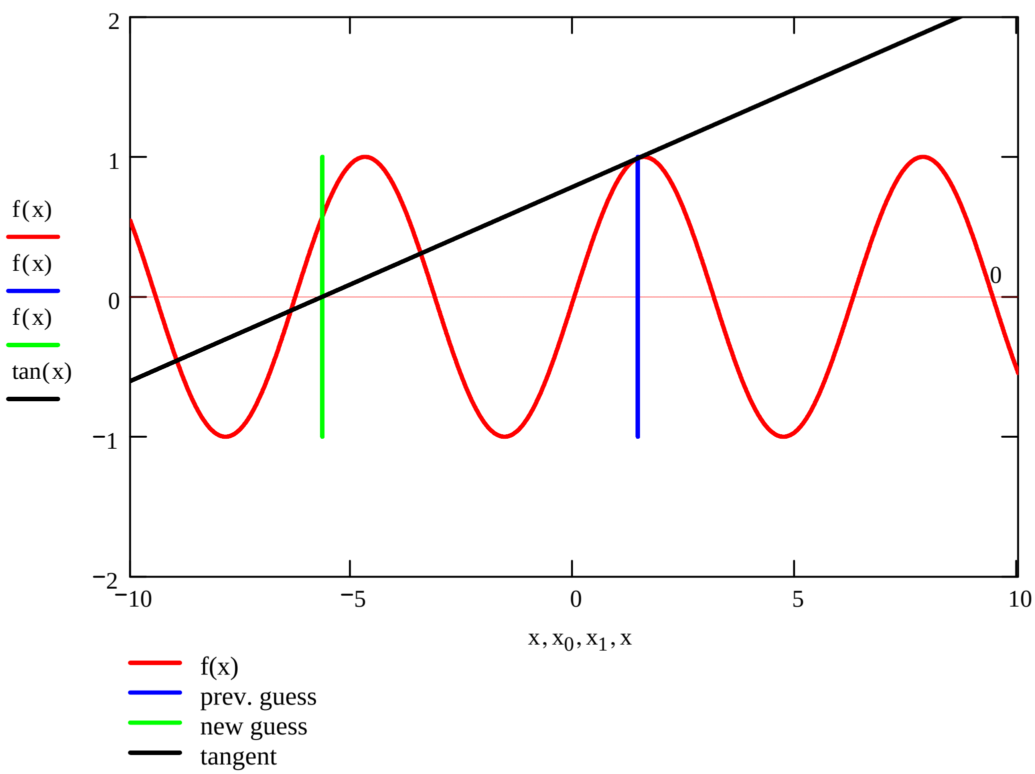
$x_1 = -5.676$

$$\varepsilon_a := \left|\frac{x_1 - x_0}{x_1}\right| \cdot 100$$

$\varepsilon_a = 125.213$

$$\tan(x) := f(x_0) + \frac{(0 - f(x_0))}{x_1 - x_0}(x - x_0)$$

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



**Iteration 2**

$$x_2 := x_1 - \frac{f(x_1)}{g(x_1)}$$

$$x_2 = -6.371$$

$$\varepsilon_a := \left| \frac{x_2 - x_1}{x_2} \right| \cdot 100$$

$$\varepsilon_a = 10.914$$

$$\tan(x) := f(x_1) + \frac{(0 - f(x_1))}{x_2 - x_1}(x - x_1)$$

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