Answer on Question #42257, Math, Linear Algebra

Problem. Using Newton-Raphson method approximates the root of the following equation in the interval (0,1) upto the three decimal places

$$f(x) = 3x - \cos x - 1$$

Note: All the calculations should be in radian.

Solution. The derivative of the function f equals

$$f'(x) = 3 + \sin x.$$

Let $x_0 = 0$. By Newton-Raphson method the better approximation x_1 equals

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 0 - \frac{-2}{3} \approx 0{,}666667.$$

The second approximation x_2 equals

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} \approx 0{,}666667 - \frac{0{,}214113}{3{,}61837} \approx 0{,}607493.$$

The second approximation x_3 equals

$$x_3 = x_2 - \frac{f(x_2)}{f'(x_2)} \approx 0{,}607493 - \frac{0{,}001397}{3{,}570811} \approx 0{,}607102.$$

The root equals $x^* \approx 0{,}607$, as $|x_3 - x_2| < 0{,}001$.

Answer. $x^* \approx 0{,}607$.