

Given a transcendental equation, such as:

$$\sin(x) = x - 1$$

Solve for one of the x values, such as:

$$x = \sin(x) + 1 \quad \text{or} \quad x = \sin^{-1}(x - 1)$$

The x 's on the right hand side will be referred to as x_{RHS} . The single x on the left hand side will be referred to as x_{LHS} .

$$x = \sin(x) + 1$$

x_{LHS} x_{RHS}

The objective is to guess an initial x value (start with $x_{\text{RHS}} = 1.00$) and solve for the single x on the left hand side (x_{LHS}). Next, substitute the new x value (x_{LHS}) into x_{RHS} and start the process over again, such as:

initial guess ($x = 1.00$)
↓

$$\begin{aligned} 1.841470985 &= \sin(1.000000000) + 1 \\ 1.963590725 &= \sin(1.841470985) + 1 \\ 1.923843052 &= \sin(1.963590725) + 1 \\ &\dots \end{aligned}$$

Label each iteration and calculate the error using;

$$\text{error} = |x_{\text{RHS}} - x_{\text{LHS}}|$$

absolute value

where the absolute value makes the value positive.

You should setup a excel file such as:

equation to solve: $x = \sin(x) + 1$

iteration number	x_RHS [radians]	x_LHS [radians]	error [radians]
1	1.0	1.84147	8E-01
2	1.84147	1.96359	1E-01
3	1.96359	1.92384	4E-02
4	1.92384	1.93832	1E-02
5	1.93832	1.93322	5E-03
6	1.93322	1.93504	2E-03
7	1.93504	1.93439	6E-04
8	1.93439	1.93462	2E-04
9	1.93462	1.93454	8E-05
10	1.93454	1.93457	3E-05
11	1.93457	1.93456	1E-05
12	1.93456	1.93456	4E-06
13	1.93456	1.93456	1E-06
14	1.93456	1.93456	5E-07
15	1.93456	1.93456	2E-07
16	1.93456	1.93456	6E-08
17	1.93456	1.93456	2E-08
18	1.93456	1.93456	7E-09
19	1.93456	1.93456	3E-09
20	1.93456	1.93456	9E-10
21	1.93456	1.93456	3E-10
22	1.93456	1.93456	1E-10
23	1.93456	1.93456	4E-11
24	1.93456	1.93456	2E-11
25	1.93456	1.93456	5E-12
26	1.93456	1.93456	2E-12
27	1.93456	1.93456	7E-13
28	1.93456	1.93456	2E-13
29	1.93456	1.93456	9E-14
30	1.93456	1.93456	3E-14