Example:

Using the bisection method, find the root of

$$f(x) = x^6 - x - 1 = 0$$

accurate to within ε = 0.001. Given that $x_a = 1$ and $x_b = 2$.

n	x_a	x_b	x_m	$f(x_a)$	$f(x_m)$	$\lvert x_b - x_m \rvert$
1	1.0000	2.0000	1.5000	-1	8.8906	0.5000
2	1.0000	1.5000	1.2500	-1	1.5647	0.2500
3	1.0000	1.2500	1.1250	-1	-0.0977	0.1250
4	1.1250	1.2500	1.1875	-0.0977	0.6167	0.0625
5	1.1250	1.1875	1.1562	-0.0977	0.2333	0.0312
6	1.1250	1.1562	1.1406	-0.0977	0.0616	0.0156
7	1.1250	1.1406	1.1328	-0.0977	-0.0196	0.0078
8	1.1328	1.1406	1.1367	-0.0197	0.0206	0.0039
9	1.1328	1.1367	1.1348	-0.0197	0.0004	0.0020
10	1.1328	1.1348	1.1338	-0.0197	-0.0096	0.0010

$\therefore\ x = 1.1338.$

Example:

Employ initial guess of x_0 = 1, doing 3 iterations of the simple fixed point iteration for $\ln x^2 = 0.7$.

Then, show that the fixed-point iteration diverges for any x_0 in the interval [0,1].

Rewrite the equation as:

$$x = x + \ln x^2 - 0.7 = g(x)$$

Given $x_0 = 1$

i	x_i
1	0.3
2	–2.8079
3	–1.4430

Since $g'(x)| = \left|1+\frac{2}{x}\right| < 1$ is only satisfied when $x < -1$, hence the fixed-point iteration diverges for any x_0 in the interval [0,1].

Example:

Use the Newton-Raphson method to estimate the root of $f(x) = 0.9x^2 + 1.7x - 5$ employing an initial guess of $x_0 = 1$ accurate to within $\varepsilon = 0.001$.

We have $f(x) = 0.9x^2 + 1.7x - 5$,

So $f'(x) = 1.8x + 1.7$

i	x_i	$f(x_i)$	$f'(x_i)$	$f(x_i)/f'(x_i)$	$\lvert x_i - x_{i-1} \rvert$
0	1	−2.4	3.5	−0.6857	
1	1.6857	0.4232	4.7343	0.0894	0.6857
2	1.5963	0.0072	4.5734	0.0016	0.0894
3	1.5947	−0.0002	4.5705	−0.00004	0.0016
4	1.5947	−0.0002	4.5705	−0.00004	0.0000

$\therefore x \approx 1.5947$