

```

In[ ]:= RegulaFalsiWE[x0_, x1_, error_, f_] :=
Module[{xk, xk1, xk2}, xk = N[x0]; xk1 = N[x1];
If[f[xk] * f[xk1] > 0,
Print["We cannot continue with Regula Falsi Method as function
values are not of opposite sign at end points of interval"];
Return[]];
i = 0; fValueAtRoot = 10000000;
output = {};
While[fValueAtRoot > error, xk2 = (xk * f[xk1] - xk1 * f[xk]) / (f[xk1] - f[xk]);
interval =
"[" <> ToString[NumberForm[xk, 12]] <> ", " <> ToString[NumberForm[xk1, 12]] <> "];
i++;
output = Append[output, {i, interval, xk2, f[xk2]}];
fValueAtRoot = Abs[f[xk2]];
If[Sign[f[xk1]] == Sign[f[xk2]], xk1 = xk2, xk = xk2];];
Print[NumberForm[
TableForm[output, TableHeadings -> {None, {"i", "Interval", "xi", "f[xi]"}}, 8]];
Print["Number of iterations required to achieve desired accuravy = ", i];
Print["Root after ", i, " iterations = ", NumberForm[xk2, 8]];
Print["Function value at approximated root, f[xi] = ", NumberForm[f[xk2], 8]];];

```

Question 1

```

g[x_] := x^3 - 5 * x + 1;
error = 10^(-4);
RegulaFalsiWE[0, 1, error, g]

```

Out[]:= Question

| i | Interval | xi | f[xi] |
|---|---------------------|------------|-----------------|
| 1 | [0., 1.] | 0.25 | -0.234375 |
| 2 | [0., 0.25] | 0.20253165 | -0.0043505686 |
| 3 | [0., 0.20253164557] | 0.20165433 | -0.000071505985 |

Number of iterations required to achieve desired accuravy = 3

Root after 3 iterations = 0.20165433

Function value at approximated root, f[xi] = -0.000071505985

Question 2

```

In[ ]:= g[x_] := Cos[x] - x * Exp[x];
error = 10^(-4);
RegulaFalsiWE[0, 1, error, g]

```

| i | Interval | xi | f[xi] |
|---|----------------------|------------|---------------|
| 1 | [0., 1.] | 0.31466534 | 0.51987117 |
| 2 | [0.314665337801, 1.] | 0.44672814 | 0.20354478 |
| 3 | [0.446728144591, 1.] | 0.49401534 | 0.070802349 |
| 4 | [0.494015336596, 1.] | 0.50994614 | 0.023607719 |
| 5 | [0.509946140365, 1.] | 0.51520101 | 0.0077601137 |
| 6 | [0.515201009902, 1.] | 0.51692221 | 0.0025388647 |
| 7 | [0.516922210011, 1.] | 0.51748468 | 0.00082935789 |
| 8 | [0.517484676785, 1.] | 0.51766834 | 0.00027078573 |
| 9 | [0.517668344978, 1.] | 0.51772831 | 0.00008839713 |

Number of iterations required to achieve desired accuravy = 9

Root after 9 iterations = 0.51772831

Function value at approximated root, $f[xi] = 0.00008839713$

Question 3

```
In[*]:= g[x_] := x^4 - 3 * x^2 + x - 10;
error = 10^(-4);
RegulaFalsiWE[2, 3, error, g]
```

| i | Interval | xi | f[xi] |
|----|---------------------|-----------|-----------------|
| 1 | [2., 3.] | 2.0784314 | -2.2198625 |
| 2 | [2.07843137255, 3.] | 2.119995 | -1.1637008 |
| 3 | [2.11999499205, 3.] | 2.1412571 | -0.59162874 |
| 4 | [2.14125711528, 3.] | 2.1519325 | -0.29607559 |
| 5 | [2.15193245843, 3.] | 2.1572414 | -0.1469951 |
| 6 | [2.15724139986, 3.] | 2.159869 | -0.072691406 |
| 7 | [2.15986895617, 3.] | 2.1611663 | -0.035876602 |
| 8 | [2.16116631787, 3.] | 2.1618061 | -0.017689628 |
| 9 | [2.16180613802, 3.] | 2.1621215 | -0.0087180329 |
| 10 | [2.16212149459, 3.] | 2.1622769 | -0.0042955224 |
| 11 | [2.1622768839, 3.] | 2.1623534 | -0.0021162309 |
| 12 | [2.16235343985, 3.] | 2.1623912 | -0.0010425221 |
| 13 | [2.16239115419, 3.] | 2.1624097 | -0.00051356481 |
| 14 | [2.16240973305, 3.] | 2.1624189 | -0.00025298759 |
| 15 | [2.16241888522, 3.] | 2.1624234 | -0.00012462357 |
| 16 | [2.16242339366, 3.] | 2.1624256 | -0.000061390296 |

Number of iterations required to achieve desired accuravy = 16

Root after 16 iterations = 2.1624256

Function value at approximated root, $f[xi] = -0.000061390296$