Ancito, Mary Kate F

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If $m=0$	1) $f(x) = x^3 - x - 2$, $[1,2]$
m is root	2) $f(x) = e^x - 3$, $[1,2]$
else	3) $f(x) = \cos(x) - x$, $[0,1]$
if $f(a) \cdot f(m) < 0$ $b=m$	4) $f(x) = \ln(x+1) - 1$, $[1,2]$
else $a=m$	

Four decimals each iteration & three decimals at the end

$f(x) = x^3 - x - 2$, $[1,2]$ The root of $f(x) = x^3 - x - 2$, on $[1,2]$ is approximately between the interval $[1.5, 1.563]$

Iteration	Interval $[a,b]$	Midpoint, m	f(m)	New Interval	Interval Length
1	[1,2]	1.5	-0.125	[1.5, 2]	0.5
2	[1.5, 2]	1.75	1.609	[1.5, 1.75]	0.25
3	[1.5, 1.75]	1.625	0.666	[1.5, 1.625]	0.125
4	[1.5, 1.625]	1.563	0.252	[1.5, 1.563]	0.063

$f(x) = e^x - 3$, $[1,2]$ The root of $f(x) = e^x - 3$, on $[1,2]$ is approximately between the interval $[1.063, 1.125]$

1	[1,2]	1.5	1.482	[1, 1.5]	0.5
2	[1, 1.5]	1.25	0.490	[1, 1.25]	0.25
3	[1, 1.25]	1.125	0.080	[1, 1.125]	0.125
4	[1, 1.125]	1.063	-0.106	[1.063, 1.125]	0.063

$f(x) = \cos(x) - x$, $[0,1]$ The root of $f(x) = \cos(x) - x$, on $[0,1]$ is approximately between the interval $[0.688, 0.75]$

1	[0,1]	0.5	0.378	[0.5, 1]	0.5
2	[0.5, 1]	0.75	-0.018	[0.5, 0.75]	0.25
3	[0.5, 0.75]	0.625	0.186	[0.625, 0.75]	0.125
4	[0.625, 0.75]	0.688	0.085	[0.688, 0.75]	0.063

$f(x) = \ln(x+1) - 1$, $[1,2]$ The root of $f(x) = \ln(x+1) - 1$, on $[1,2]$ is approximately between the interval $[1.688, 1.75]$

1	[1,2]	1.5	-0.084	[1.5, 2]	0.5
2	[1.5, 2]	1.75	0.012	[1.5, 1.75]	0.25
3	[1.5, 1.75]	1.625	-0.035	[1.625, 1.75]	0.125
4	[1.625, 1.75]	1.688	-0.011	[1.688, 1.75]	0.063

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$f(x) = x^3 - x - 2$, $[1,2]$

Iteration 1

① $f(a) \cdot f(b) < 0$ $\quad \overset{a\,b}{[1,2]}$

$f(1) = 1^3 - 1 - 2$	$f(2) = 2^3 - 2 - 2$
$= 1 - 1 - 2$	$= 8 - 2 - 2$
$= -2$	$= 6 - 2$
	$= 4$

$(-2)(4) = -8 < 0$

② $m = \frac{a+b}{2}$

$m = \frac{1+2}{2} = \frac{3}{2} = 1.5$

③ $f(m)$

$f(1.5) = (1.5)^3 - 1.5 - 2$

$= 3.375 - 1.5 - 2$

$= 1.875 - 2$

$= -0.125$

$m = 0$ ✗

$f(a) \cdot f(m) < 0$; $(-2)(-0.125) =$

$0.25 < 0$, $b = m$ ✗

$a = m$ ✓

④ $[1.5, 2]$

$2 - 1.5 = 0.5$

Iteration 2.

① $f(a) \cdot f(b) < 0$ $\quad [1.5, 2]$

$f(1.5) = (1.5)^3 - 1.5 - 2$	$f(2) = 2^3 - 2 - 2$
$= 3.375 - 1.5 - 2$	$= 8 - 2 - 2$
$= 1.875 - 2$	$= 6 - 2$
$= -0.125$	$= 4$

$(-0.125)(4) = -0.5 < 0$

② $m = \frac{a+b}{2}$

$m = \frac{1.5+2}{2} = \frac{3.5}{2} = 1.75$

③ $f(m)$

$f(1.75) = (1.75)^3 - 1.75 - 2$

$= 5.3594 - 1.75 - 2$

$= 3.6094 - 2$

$= 1.6094$

$m = 0$ ✗

$f(a) \cdot f(m) < 0$, $(-0.125)(1.6094) =$

$-0.2011 < 0$, $b = m$ ✓

④ $[1.5, 1.75]$

$1.75 - 1.5 = 0.25$

Iteration 3

① $f(a) \cdot f(b) < 0$ $\quad [1.5, 1.75]$

$f(1.5) = (1.5)^3 - 1.5 - 2$	$f(1.75) = (1.75)^3 - 1.75 - 2$
$= 3.375 - 1.5 - 2$	$= 5.3594 - 1.75 - 2$
$= 1.875 - 2$	$= 3.6094 - 2$
$= -0.125$	$= 1.6094$

② $m = \frac{a+b}{2}$

$m = \frac{1.5 + 1.75}{2} = 1.625$

④ $f(m)$

$f(1.625) = (1.625)^3 - 1.625 - 2$ $\quad m = 0$ ✗

$= 4.2910 - 1.625 - 2$

$= 2.666 - 2$

$= 0.666$

$f(a) \cdot f(m) < 0$;

$(-0.125)(0.666) < 0$

$-0.0834 < 0$ ✓

$b = m$

④ $[1.5, 1.625]$

$1.625 - 1.5 = 0.125$

Iteration 4

① $f(a) \cdot f(b) < 0$, $[1.5, 1.625]$

$f(1.5) = (1.5)^3 - 1.5 - 2$	$f(1.625) = (1.625)^3 - 1.625 - 2$
$= 3.375 - 1.5 - 2$	$= 4.2910 - 1.625 - 2$
$= 1.875 - 2$	$= 2.666 - 2$
$= -0.125$	$= 0.666$

② $m = \frac{a+b}{2}$

$m = \frac{1.5 + 1.625}{2} = 1.5625$

③ $f(m)$

$f(1.5625) = (1.5625)^3 - 1.5625 - 2$

$= 3.8147 - 1.5625 - 2$

$= 2.2522 - 2$

$= 0.2522$

$m = 0$ ✗

$f(a) \cdot f(m) < 0$; $(-0.125)(0.2522)$

$= -0.0315 < 0$ ✓

$b = m$

④ $[1.5, 1.5625]$

$1.5625 - 1.5 = 0.0625$

$1.563 - 1.5 = 0.063$

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$f(x) = e^x - 3$, $[1, 2]$

Iteration 1

① $f(a) \cdot f(b) < 0$ $[\overset{a}{1}, \overset{b}{2}]$

$f(1) = e^1 - 3$ | $f(2) = e^2 - 3$

$= 2.7183 - 3$ | $= 7.3891 - 3$

$= -0.2817$ | $= 4.3891$

$(-0.2817)(4.3891) = -1.2364 < 0$

② $m = \frac{a+b}{2}$

$m = \frac{1+2}{2} = \frac{3}{2} = 1.5$

③ $f(m)$

$f(1.5) = e^{1.5} - 3$

$= 4.4817 - 3$

$= 1.4817$

$m = 0$ ✗

$f(a) \cdot f(m) < 0$, $(-0.2817)(1.4817)$

$-0.4174 < 0$

$b = m$ ✓

④ $[1, 1.5]$

$1.5 - 1 = 0.5$

Iteration 2

① $f(a)\ f(b) < 0$ $[1, 1.5]$

$f(1) = e^1 - 3$ | $f(1.5) = e^{1.5} - 3$

$= 2.7183 - 3$ | $= 4.4817 - 3$

$= -0.2817$ | $= 1.4817$

$(-0.2817)(1.4817) = -0.4174 < 0$

② $m = \frac{a+b}{2}$

$m = \frac{1+1.5}{2} = \frac{2.5}{2} = 1.25$

③ $f(m)$

$f(1.25) = e^{1.25} - 3$

$= 3.4903 - 3$

$= 0.4903$

$m = 0$ ✗

$f(a) \cdot f(m) < 0$, $(-0.2817)(0.4903)$

$= -0.1381 < 0$

$b = m$ ✓

④ $[1, 1.25]$

$1.25 - 1 = 0.25$

Iteration 3

① $f(a) \cdot f(b) < 0$ $[1, 1.25]$

$f(1) = e^1 - 3$ | $f(1.25) = e^{1.25} - 3$

$= 2.7183 - 3$ | $= 3.4903 - 3$

$= -0.2817$ | $= 0.4903$

$(-0.2817)(0.4903) = -0.1381 < 0$

② $m = \frac{a+b}{2}$

$m = \frac{1+1.25}{2} = 1.125$

③ $f(m)$

$f(1.125) = e^{1.125} - 3$

$= 3.0802 - 3$

$= 0.0802$

$m = 0$ ✗

$f(a) \cdot f(m) < 0$; $(-0.2817)(0.0802)$

$= -0.0226 < 0$

$b = m$ ✓

④ $[1, 1.125]$

$1.125 - 1 = 0.125$

Iteration 4

① $f(a) \cdot f(b) < 0$, $[1, 1.125]$

$f(1) = e^1 - 3$	$f(1.125) = e^{1.125} - 3$
$= 2.7183 - 3$	$= 3.0802 - 3$
$= -0.2817$	$= 0.0802$

$(-0.2817)(0.0802) = -0.0226 < 0$

② $m = \frac{a+b}{2}$

$= \frac{1+1.125}{2} = 1.0625$

③ $f(m)$

$f(1.0625) = e^{(1.0625)} - 3$

$= 2.8936 - 3$

$= -0.1064$

$m = 0$ ✗

$f(a) \cdot f(m) < 0$; $(-0.2817)(-0.1064)$

< 0

$b = m$ ✗

$a = m$ ✓

④ $[1.0625, 1.125]$

$1.125 - 1.0625 = 0.0625$

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$f(x) = \cos(x) - x$, $[0,1]$

Iteration 1

① $f(a) \cdot f(b) < 0$

$f(0) = \cos(0) - 0$
$= 1 - 0$
$= 1$

$f(1) = \cos(1) - 1$
$= 0.5403 - 1$
$= -0.4597$

$(1)(-0.4597) = -0.4597 < 0$

② $m = \frac{a+b}{2}$

$m = \frac{0+1}{2} = \frac{1}{2} = 0.5$

③ $f(m)$

$f(0.5) = \cos(0.5) - 0.5$
$= 0.8776 - 0.5$
$= 0.3776$

$m = 0$ ✗

$f(a) \cdot f(m) < 0$; $(1)(0.3776) =$
$0.3776 < 0$ ✗

$b = m$

$a = m$ ✓

④ $[0.5, 1]$

$1 - 0.5 = 0.5$

Iteration 2

① $f(a) \cdot f(b) < 0$ $[0.5, 1]$

$f(0.5) = \cos(0.5) - 0.5$
$= 0.8776 - 0.5$
$= 0.3776$

$f(1) = \cos(1) - 1$
$= 0.5403 - 1$
$= 0.4597$

$(0.3776)(0.4597) = 0.1736 < 0$

② $m = \frac{a+b}{2}$

$= \frac{0.5+1}{2} = \frac{1.5}{2} = 0.75$

③ $f(m)$

$f(0.75) = \cos(0.75) - 0.75$
$= 0.7317 - 0.75$
$= -0.0183$

$m = 0$ ✗

$f(a) \cdot f(m) < 0$; $(0.3776)(-0.0183)$
$-0.0069 < 0$ ✓

$b = m$

$a = m$ ✗

④ $[0.5, 0.75]$

$0.75 - 0.5 = 0.25$

Iteration 3

① $f(a) \cdot f(b) < 0$, $[0.5, 0.75]$

$f(0.5) = \cos(0.5) - 0.5$
$= 0.8776 - 0.5$
$= 0.3776$

$f(0.75) = \cos(0.75) - 0.75$
$= 0.7317 - 0.75$
$= -0.0183$

$(0.3776)(-0.0183) = -0.0069 < 0$

② $m = \frac{a+b}{2}$

$m = \frac{0.5+0.75}{2} = 0.625$

③ $f(m)$

$f(0.625) = \cos(0.625) - 0.625$
$= 0.8111 - 0.625$
$= 0.1861$

$m = 0$ ✗

$f(a) \cdot f(m) < 0$; $(0.3776)(0.1861)$
$= 0.0703 < 0$ ✗

$b = m$

$a = m$ ✓

④ $[0.625, 0.75]$

$0.75 - 0.625 = 0.125$

Iterasi 4

① $f(a) \cdot f(b) < 0$ $[0.625, 0.75]$

$f(0.625) = \cos(0.625) - 0.625$	$f(0.75) = \cos(0.75) - 0.75$
$= 0.8111 - 0.625$	$= 0.7317 - 0.75$
$= 0.1861$	$= -0.0183$

$(0.1861)(-0.0183) = -0.0034 < 0$

② $m = \frac{a+b}{2}$

$= \frac{0.625 + 0.75}{2}$

$= 0.6875$

$f(m)$

$f(0.6875) = \cos(0.6875) - 0.6875$

$= 0.7728 - 0.6875$

$= 0.0853$

$m = 0$ ✗

$f(a) \cdot f(m) < 0$; $(0.1861)(0.0853) = 0.0159$

$b = m$ ✗

$a = m$ ✓

④ $[0.6875, 0.75]$

$0.75 - 0.6875 = 0.0625$

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$f(x) = \ln(x+1) - 1, \ [1,2]$

Iteration 1

① $f(a) \cdot f(b) < 0 \quad [1,2]$

$f(1) = \ln(1+1) - 1$
$= \log(2) - 1$
$= 0.6931 - 1$
$= -0.3069$

$f(2) = \ln(2+1) - 1$
$= \log(3) - 1$
$= 1.0986 - 1$
$= 0.0986$

$(-0.3069)(0.0986) = -0.0303 < 0$ ✓

② $m = \frac{a+b}{2}$
$= \frac{1+2}{2} = \frac{3}{2} = 1.5$

③ $f(m)$

$f(1.5) = \ln(1.5+1) - 1$
$= \log(2.5) - 1$
$= 0.9163 - 1$
$= -0.0837$

$m = 0$ ✗

$f(a) \cdot f(b) < 0$; $(-0.3069)(-0.0837)$
$0.0257 < 0$ ✗

$b = m$
$a = m$ ✓

④ $[1.5, 2]$
$2 - 1.5 = 0.5$

Iteration 2

① $f(a) \cdot f(b) < 0 \quad [1.5, 2]$

$f(1.5) = \ln(1.5+1) - 1$
$= \log(2.5) - 1$
$= 0.9163 - 1$
$= -0.0837$

$f(2) = \ln(2+1) - 1$
$= \log(3) - 1$
$= 1.0986 - 1$
$= 0.0986$

$(-0.037)(0.0986) = -0.0036$

② $m = \frac{a+b}{2}$
$= \frac{1.5+2}{2} = \frac{3.5}{2} = 1.75$

③ $f(m)$

$f(1.75) = \ln(1.75+1) - 1$
$= 1.0116 - 1$
$= 0.0116$

$m = 0$ ✗

$f(a) \cdot f(b) < 0$; $(-0.0837)(0.0116)$
$-0.0010 < 0$ ✓

$b = m$

④ $[1.5, 1.75]$
$1.75 - 1.5 = 0.25$

Iteration 3

① $f(a) \cdot f(b) < 0 \quad [1.5, 1.75]$

$f(1.5) = \ln(1.5+1) - 1$
$= 0.9163 - 1$
$= -0.0837$

$f(1.75) = \ln(1.75+1) - 1$
$= 1.0116 - 1$
$= 0.0116$

$(0.0837)(0.0116) = -0.0010$ ✗

② $m = \frac{a+b}{2}$
$m = \frac{1.5+1.75}{2} = 1.625$

③ $f(m)$

$f(1.625) = \ln(1.625+1) - 1$
$= 0.9651 - 1$

$f(a) \cdot f(m) < 0$;
$(-0.0837)(-0.0349) < 0$
$0.0029 < 0$ ✗

$b = m$
$a = m$ ✓

④ $[1.625, 1.75]$
$1.75 - 1.625 = 0.125$

Iteration 4

① $f(a) \cdot f(b) < 0$ $[1.625, 1.75]$

$f(1.625) = \ln(1.625+1) - 1$
$= 0.9651 - 1$
$= -0.0349$

$f(1.75) = \ln(1.75+1) - 1$
$= 1.0116 - 1$
$= 0.0116$

$(-0.0349)(0.0116) = 0.0004 < 0$ ×

② $m = \frac{a+b}{2}$

$m = \frac{1.625+1.75}{2}$

$= 1.6875$

③ $f(m)$

$f(1.6875) = \ln(1.6875+1) - 1$

$= 0.9886 - 1$

$= -0.0114$

$m = 0$ ×

$f(a)f(m) < 0$; $(-0.0349)(-0.0114)$

$0.0040 < 0$ ×

$b = m$

$a = m$

④ $[1.6875, 1.75]$

$1.75 - 1.6875 = 0.0625$