

Math 17A

Kouba

Bisection Method

Example: Estimate the value of the solution to $x^3 + x = 4$ to two decimal places. First write $x^3 + x - 4 = 0$, let $f(x) = x^3 + x - 4$, and solve $f(x) = 0$ using the Bisection Method. Note that $f(1) = -2$ and $f(2) = +6$, so choose $a = 1$, $b = 2$, and let next "guess" be $\frac{1}{2}(a+b) = \frac{1}{2}(1+2) = \frac{3}{2}$. Continue this process:

$$f(x) = x^3 + x - 4$$

<u>a</u>	<u>b</u>	<u>$\frac{1}{2}(a+b)$</u>	<u>f(a)</u>	<u>f(b)</u>	<u>$f(\frac{1}{2}(a+b))$</u>
1	2	1.5	-2	+6	+0.875
1	1.5	1.25	-2	+0.875	-0.797
1.25	1.5	1.375	-0.797	+0.875	-0.025
1.375	1.5	1.438	-0.025	+0.875	+0.412
1.375	1.438	1.407	-0.025	+0.412	+0.192
1.375	1.407	1.391	-0.025	+0.192	+0.082
1.375	1.391	1.383	-0.025	+0.082	+0.028
1.375	1.383	1.379	-0.025	+0.028	+0.001
1.375	1.379	1.377	-0.025	+0.001	-0.012

So solution $r \approx 1.37$.