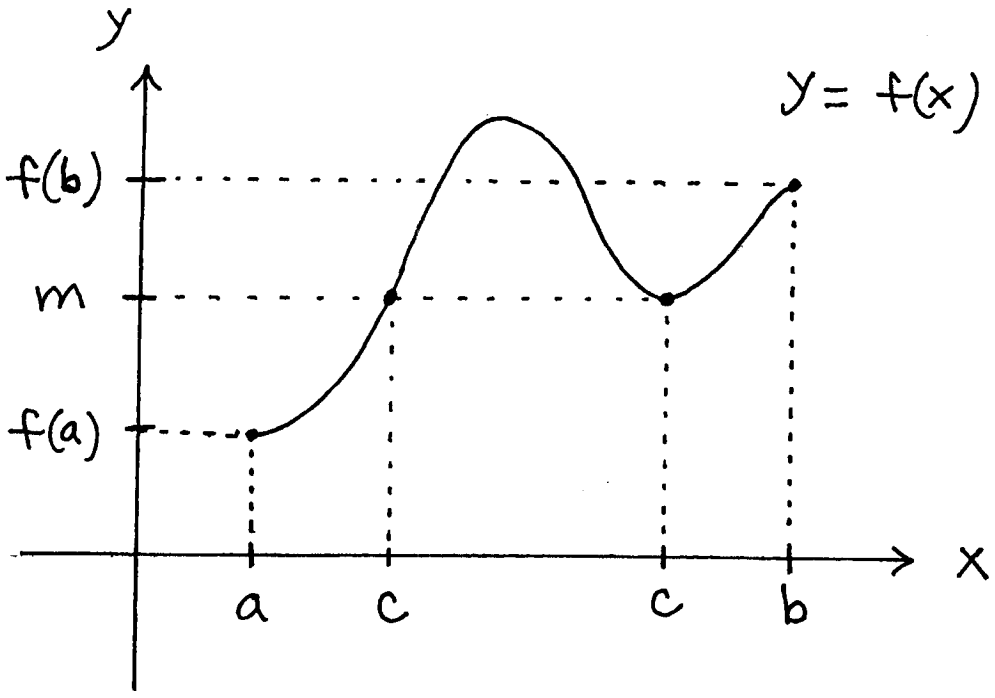
Math 17A
Vogler

Intermediate Value Theorem (IMVT) : Let f be a continuous function on the closed interval $[a, b]$. Let m be any number between $f(a)$ and $f(b)$. Then there is at least one number c in $[a, b]$ which satisfies

$$f(c) = m \, .$$



When applying the IMVT to a problem, the following five steps must be clearly established:

1. Define a function f.
2. Define a number m.
3. Establish that f is continuous.
4. Choose an interval $[a, b]$.
5. Indicate that m is between $f(a)$ and $f(b)$.

Once these five steps have been established, the conclusion of the IMVT can be invoked.

Table for Bisection Method

Let $f(x) = x^3 + x - 4$. Goal: Find $f(x) = 0$ for x in $[1, 2]$ up to 2 decimal places.

a	b	1/2(a+b)	f(a)	f(b)	f(1/2(a+b))
1	2	1.500	-2.000	6.000	0.875
1	1.5	1.250	-2.000	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	0.408
1.375	1.438	1.407	-0.025	0.412	0.189
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

Note: The shaded region represents the choice of new interval in the bisection method.

Conclude: $x \approx 1.37$ is such that $f(x) = 0$.