

§1.8... Intermediate Value Theorem

Def'n. A function f is continuous at $x=a$ iff

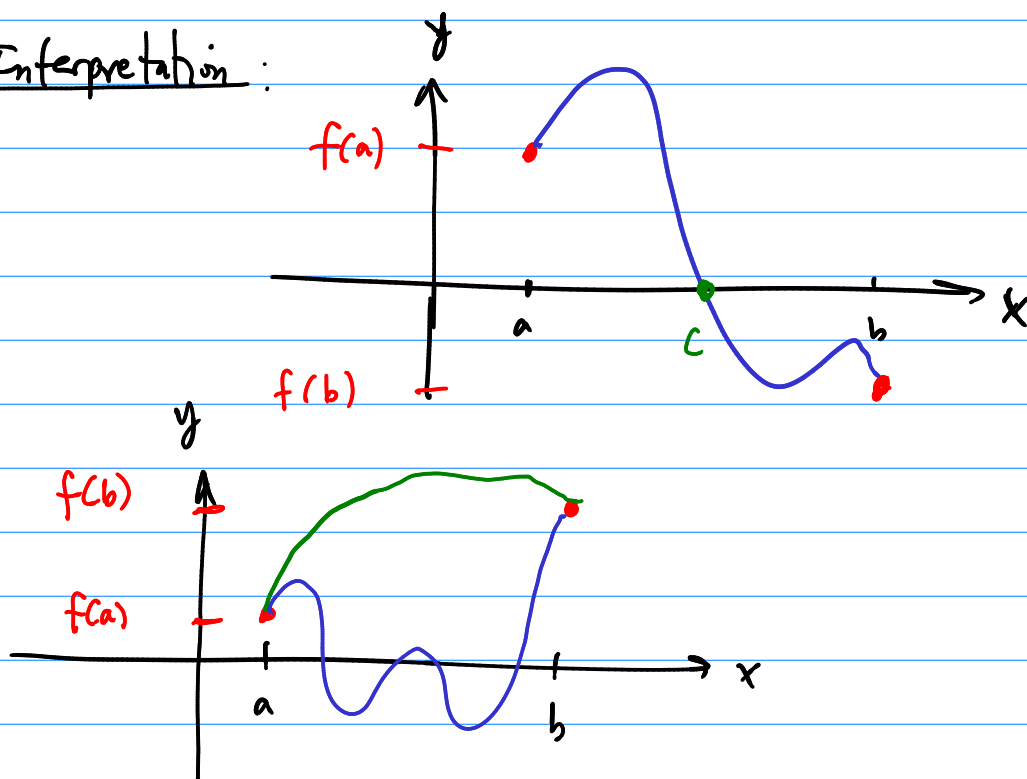
$$\lim_{x \rightarrow a} f(x) = f(a).$$

Theorem. (Intermediate Value Theorem). Consider a function $y = f(x)$ that is defined on an interval $[a, b]$, and suppose f is continuous on $[a, b]$.

If $f(a)$ and $f(b)$ have different signs, then f has a zero at some number c such that $a < c < b$.

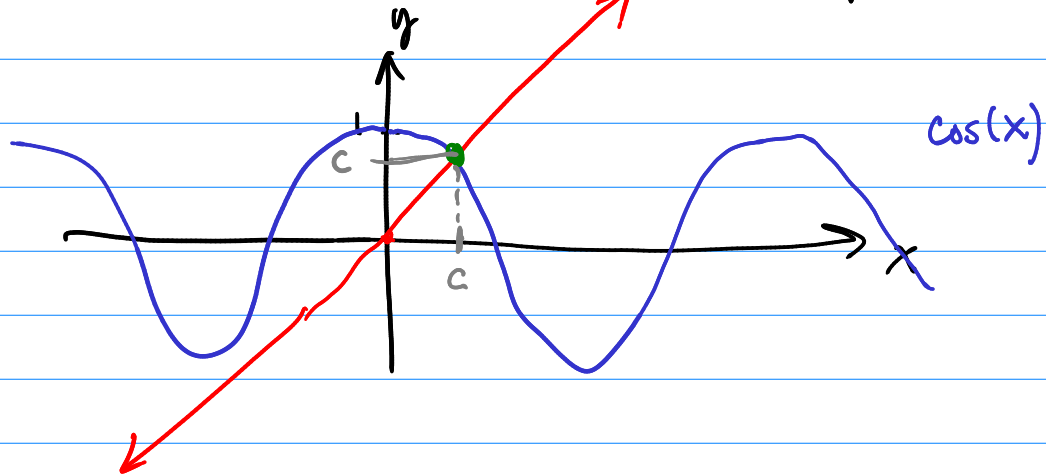
if c is a zero of f , then $f(c) = 0$.

Graphical Interpretation:



Ex. $\cos(x) = x$

Question: Does a solution exist? Y_{up}



Q2. Can we approximate c ?

$$\cos(x) = x \rightarrow \underbrace{\cos(x) - x}_f = 0$$

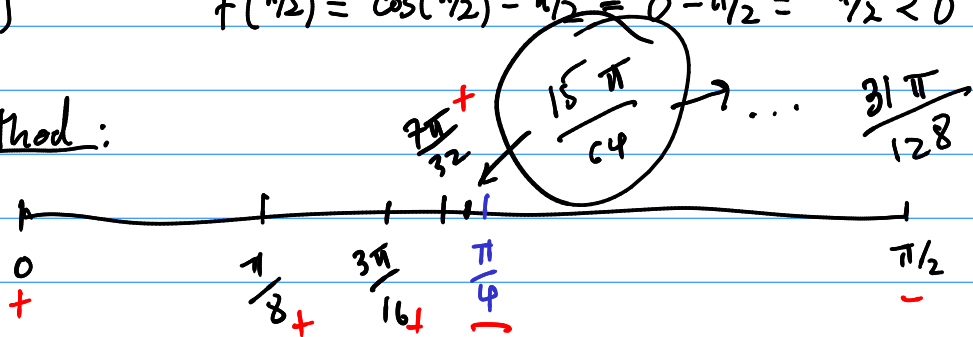
IVT: f is continuous? Yes bc trig functions and polynomials are both cont.

$$\left. \begin{array}{l} a = 0 \\ b = \pi/2 \end{array} \right\}$$

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

$$f(\pi/2) = \cos(\pi/2) - \pi/2 = 0 - \pi/2 = -\pi/2 < 0$$

Bisection method:



To 2 decimal places, $\cos(15\pi/64) \approx 15\pi/64$

Next: try $\frac{61\pi}{256}$

Test opens 8/29 @ 12:30 pm
closes 9/4 @ 8:30 am

WebAssign
10-15 ds