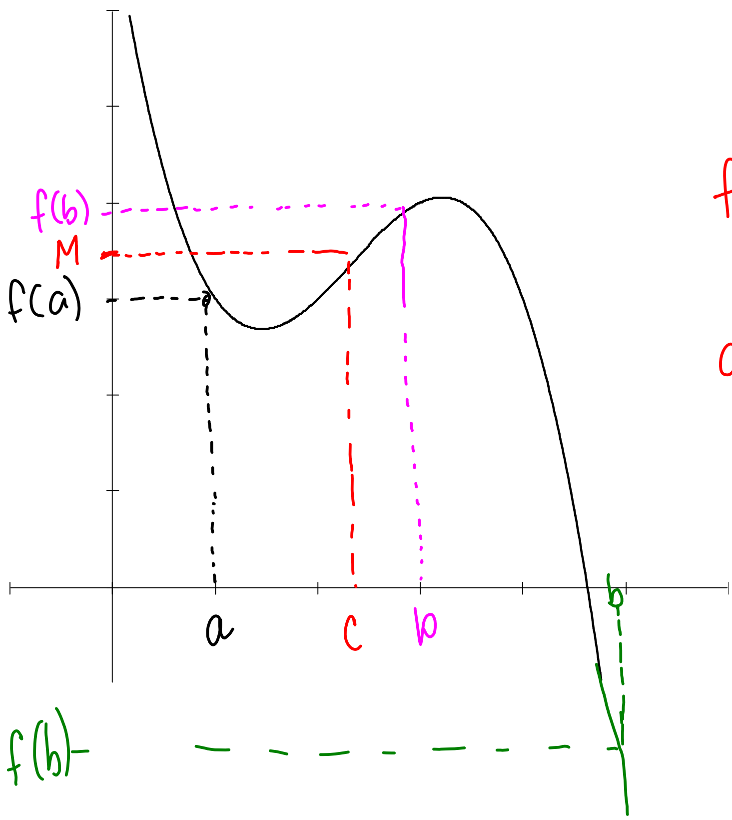
# 2.8 Intermediate Value Theorem

**IVT** Intermediate Value Theorem:

If *f(x)* is continuous on a closed interval $[a, b]$ and $f(a) \neq f(b)$, then for every value *M* between *f(a)* and *f(b)*, there exists at least one value c in *(a,b)* such that *f(c)=M*




$f(c) = M$

$a < c < b$

Existence of Zeros: If *f(x)* is continuous on $[a, b]$ and if *f(a)* and *f(b)* are nonzero and have opposite signs, then *f(x)* has a zero in *(a,b)*

Use the intermediate value theorem to show that the polynomial function $f(x) = x^3 + 2x - 1$ has a $\boxed{\text{zero}}$ on $[0,1]$

f(x) is continuous; polynomial function

zero $M = 0$ Need $f(c) = 0$

$[0,1]$ $a = 0$ $b = 1$

$f(0) = 0^2 + 2(0) - 1$

$f(0) = -1$

$f(1) = 1^3 + 2(1) - 1$

$= 2$

$f(0) \neq f(1)$

$-1 \neq 2$

$f(0) < M < f(1)$

$-1 < 0 < 2$

yes by IVT there will be a zero on $[0,1]$