

Intermediate Value Theorem

p. 117 - 125 (2.4)

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If these 3 conditions hold,

1. f is continuous on the closed interval $[a, b]$

2. $f(a) \neq f(b)$

3. k is any number between $f(a)$ and $f(b)$

then there is at least one number c in $[a, b]$ so that $f(c) = k$.

A function has the *intermediate value property* if it never takes on two values without taking on all the values in between.

1. Use the Intermediate Value Theorem to show that

$f(x) = x^3 + 2x - 1$ has a zero in the interval $[0, 1]$.

$$f(0) = -1$$

$$f(1) = 2$$

Since f is continuous and since $f(0) < 0$ and $f(1) > 0$, ~~so~~ by the IVT there must be a zero on $[0, 1]$

**(FR)2. A car travels on a straight track. During the time interval $0 \leq t \leq 60$ seconds, the car's velocity v , measured in feet per second is a continuous function. The table below shows selected values of the function.

t in sec	0	15	25	30	35	50	60
$v(t)$ in ft/sec	-20	-30	-20	-14	-10	0	10

c) For $0 < t < 60$, must there be a time t when $v(t) = -5$?

Justify your answer.

Since v is a continuous function and since $v(0) = -20$ and $v(60) = 10$, by the IVT there must be a time when $v(t) = -5$.