DO NOW

pg 99; 36

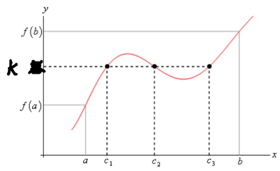
Page 1

2.4 Continuity & One-Sided Limits - Day 3

Intermediate Value Theorem:

If f is continuous on $[a,b]$ and k is any number between $f(a)$ and $f(b)$, then there is at least one number c in $[a,b]$ such that $f(c)=k$.

* maybe more than one value for c



Page 2

Example - A person's height:

↳ is a continuous function

* If some is 5' tall one year and 5'6" 2 years later....

Then they must have been 5'2" at some point

Page 3

Example - A person's bank account:

↳ is not continuous

* When there is a deposit or withdraw there is a "jump" in the function.

* If you start with \$50 and end with \$200

There is no guarantee that \$100 was ever the balance.

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Intermediate Value Theorem can be used to:

guarantee the existence of at least one zero on an interval.

Suppose P(a) and P(b) are: opposite signs (one positive and one negative)

* continuous function

Then the function must have at least one zero.

Bisection Method:

To approximate a zero - Keep cutting the interval in half to locate the zero

Page 5

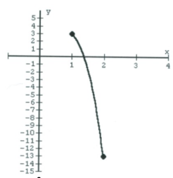
Example:

$f(x) = -x^4 - x + 5$

let a = 1 and b = 2

$f(a) = -1^4 - 1 + 5 = 3$

$f(b) = -2^4 - 2 + 5 = -13$



By the intermediate value theorem,

$\therefore$ $[1,2]$ must have at least one zero

because $f(1)$ is positive and $f(2)$ is negative.

crosses the x-axis.

$x \approx 1.3794$

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Examples: pg 100; 66

$$g(x) = \begin{cases} \frac{x^2 - a^2}{x - a} & x \neq a \\ 8, & x = a \end{cases}$$

$f(a) = \lim_{x \to a} f(x)$

$f(a) = 8$

$$\lim_{x \to a} \frac{x^2 - a^2}{x - a} = 8$$

$$\lim_{x \to a} \frac{\cancel{(x-a)}(x+a)}{\cancel{x-a}}$$

$$\lim_{x \to a} (x+a)$$

$a + a$

$2a = 8$

$a = 4$

HOMEWORK

pg 99 - 102; 63 - 69 odd, 75, 76, 83, 84, 91, 95, 103, 108

92,