

Limits.notebook

Limits

Def'n: A basic concept in Calculus expressing the idea of tending to an ultimate but unreachable value.
 x from the video
 the intended height of the function

Verbally
 L is the limit of f(x) as x approaches c iff L is the one number you can keep f(x) arbitrarily close to just by keeping x close enough to c but not equal to c if and only if

Notation:
 $\lim_{x \rightarrow c} f(x) = L$

From the video:
 the limit of a fcn (if it exists) for some x-value "a" is the height the fcn gets closer and closer to as x gets closer and closer to "a" from the left and the right
 $f(x) \rightarrow L$ as $x \rightarrow a$

Determining Limits

ex Determine the limit of the function $f(x) = 2x+3$ as x approaches 4.

A chart could be used

| | | | | | | |
|------|------|-------|--------|--------|-------|------|
| x | 3.9 | 3.99 | 3.999 | 4.001 | 4.01 | 4.1 |
| 2x+3 | 10.8 | 10.98 | 10.998 | 11.002 | 11.02 | 11.2 |

from chart
 $\lim_{x \rightarrow 4} (2x+3) = 11$

Direct substitution is much quicker

$$\lim_{x \rightarrow 4} (2x+3)$$

$$2(4)+3 = 11$$

$$\lim_{x \rightarrow 4} (2x+3) = 11$$

ex. 2 Evaluate

$$\lim_{x \rightarrow 2} \left[\frac{x^2+27}{x+3} \right]$$

$$\frac{2^2+27}{2+3} = 7$$

$$\lim_{x \rightarrow 2} \left[\frac{x^2+27}{x+3} \right] = 7$$

Note: $\lim_{x \rightarrow c} k = k$

Factoring and Conjugate Methods

ex: Determine the limits

a) $\lim_{x \rightarrow -3} \left[\frac{x^2+27}{x+3} \right]$
 direct substitution will result in $\frac{0}{0}$

∴ Factor

$$\lim_{x \rightarrow -3} \left[\frac{\cancel{(x+3)}(x^2-3x+9)}{\cancel{(x+3)}} \right]$$

$$\lim_{x \rightarrow -3} (x^2-3x+9)$$

$$(-3)^2 - 3(-3) + 9$$

$$\lim_{x \rightarrow -3} \left[\frac{x^2+27}{x+3} \right] = 27$$

b) $\lim_{x \rightarrow 9} \left[\frac{x-9}{\sqrt{x}-3} \right]$

sub results in $\frac{0}{0}$

Use the conjugate method

$$\frac{x-9}{\sqrt{x}-3} \cdot \frac{\sqrt{x}+3}{\sqrt{x}+3}$$

$$\frac{(x-9)(\sqrt{x}+3)}{x-9}$$

$$\lim_{x \rightarrow 9} \sqrt{x}+3$$

$$\sqrt{9}+3$$

$$\lim_{x \rightarrow 9} \left[\frac{x-9}{\sqrt{x}-3} \right] = 6$$

text Pg. 66
 # 7-14 omit #12
 # 20, 21, 23
 worksheet hand in # 1-4, 7-10, 13, 14