LESSON MAKER PRO

Limit Laws Lab

Evaluate limits by using continuity and algebra.

HIGH SCHOOL · MA.912.C.1.2

MA.912.C.1.2 "Determine the value of a limit if it exists algebraically using limits of sums, differences, products, quotients and compositions of continuous functions."

NAME _____ DATE _____

USE THE LIMIT LAWS

For sums, differences, products, and compositions of continuous functions, substitute the x-value into each part. For a quotient, you can substitute as long as the denominator does not equal 0 at that x-value.

WORKED EXAMPLE

Find $\lim_{x \to 12} ((x+13)(x-14))/(x+15)$.

1. The factors are continuous, and the denominator is not 0 at x=12.
2. Substitute 12: ((12+13)(12-14))/(12+15).
3. Simplify: (25(-2))/27 = -50/27.

Answer: -50/27

PRACTICE 6 problems

1 Find $\lim_{x \to 3} (2x+1)$.

ANSWER _____

2 Find $\lim_{x \to -1} (x^2-6x)$.

ANSWER _____

3 Find $\lim_{x \to 4} (x-6)(x+1)$.

ANSWER _____

4 Find $\lim_{x \to 1} (x^2+3)/(x+6)$.

ANSWER _____

5 Find $\lim_{x \to -3} (x^2+1)^3$.

ANSWER _____

6 Find $\lim_{x \to 5} (x^2-4)/(x+3)$.

ANSWER _____

APPLY IT Show your work

1 A music app models offline listening data, in gigabytes, with $D(x)=(x^2+4)/(x+1)$, where x is the number of hours spent listening. Find lim x->3 D(x).

WORK SPACE

ANSWER _____

2 A phone plan models a student's monthly cost, in dollars, with $C(x)=(2x+1)(x-3)$, where x is the number of gigabytes used above a baseline amount. Find lim x->5 C(x).

WORK SPACE

ANSWER _____

CHALLENGE One step up

Find lim x->2 $(((x^2+1)^2)-(x-1))/(x+4)$. Explain why direct substitution is valid.

WORK SPACE AND ANSWER

ANSWER KEY # Limit Laws Lab

HIGH SCHOOL · MA.912.C.1.2

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find lim x->3 (2x+1).	**7**
2	Find lim x->-1 (x^2-6x).	**7**
3	Find lim x->4 (x-6)(x+1).	**-10**
4	Find lim x->1 (x^2+3)/(x+6).	**4/7**
5	Find lim x->-3 (x^2+1)^3.	**1000**
6	Find lim x->5 (x^2-4)/(x+3).	**21/8**

PART 2 · APPLY IT

1. **13/4 gigabytes** The numerator and denominator are continuous, and the denominator is 4 when x=3. Substitute 3 to get (3^2+4)/(3+1)=13/4.
2. **22 dollars** Both factors are continuous, so substitute 5. This gives (2(5)+1)(5-3)=11(2)=22.

CHALLENGE

4. Direct substitution is valid because the numerator is made of continuous polynomial expressions and the denominator equals 6, not 0, when x=2.

Accept equivalent unsimplified forms that have the same value, such as 52/16 for 13/4. For the challenge, accept any correct explanation that cites continuity and a nonzero denominator.