What is a Limit?

Worksheet

The limit of f(x) as x approaches c is the value f(x) gets arbitrarily close to, written lim(xc) f(x) = L. For continuous functions, you can often find it by direct substitution.

@lim_{x @to +@infty} f(x) = L

Questions

1. lim(x1) (2x+5) = ?

A) 7
B) 2
C) 5
D) 9

2. lim(x4) (x16)/(x4) = ?

A) 0
B) 4
C) 8
D) 16

3. What does an indeterminate form like 0/0 signal?

A) The limit doesn't exist
B) Further algebraic work is needed
C) The function is discontinuous everywhere
D) The answer is always 0

4. lim(x0) sin(x)/x = ?

A) 0
B) 1
C) undefined
D)

5. Find lim(x2) (3x+4).

6. Find lim(x3) (x9)/(x3).

7. Find lim(x0) (sin x)/x.

8. Define: What is a limit?

9. Define: What does 0/0 mean in a limit?

10. Define: When can you use direct substitution?

Answer Key

1. A) 7 - Substitute x=1: 2(1)+5=7.
2. C) 8 - Factor to (x-4)(x+4)/(x-4)=x+4; at x=4 this gives 8.
3. B) Further algebraic work is needed - You must simplify before the limit can be evaluated.
4. B) 1 - This is a standard trigonometric limit equal to 1.
5. Since 3x+4 is continuous, substitute x=2 directly. 3(2)+4 = 6+4 = 10
6. Direct substitution gives 0/0 (indeterminate). Factor: (x9)/(x3) = (x3)(x+3)/(x3) = x+3 Substitute x=3: 3+3 = 6
7. This is a well-known limit that cannot be solved by substitution (0/0). Using the standard trigonometric limit result: lim(x0) sin(x)/x = 1
8. The value a function approaches as x gets close to a point c, written lim(xc) f(x).
9. An indeterminate form - you must simplify (factor, rationalize, etc.) before substituting.
10. When the function is continuous at that point.