Finding Limits Algebraically

A **limit** is the value that a function approaches as the input approaches a certain value. Limits are used to define continuity, derivatives, and integrals.

There are different approaches to finding limits.

Examples:

In this example, you can factor the numerator and denominator, reduce, and then substitute in the 5 for x to get your limit.

$$\lim_{x\to 5}\frac{x^2+3x-40}{x^2-25}=\frac{(x+8)\cancel{(x-5)}}{\cancel{(x-5)}(x+5)}=\frac{x+8}{x+5}=\frac{5+8}{5+5}=\frac{13}{10}$$

As "x approaches 5," the limit is $\frac{13}{10}$.

In the following example, you will need to rationalize the numerator in order to find the limit.

$$\lim_{x\to 81}\frac{\sqrt{x}-9}{x-81}\left(\frac{\sqrt{x}+9}{\sqrt{x}+9}\right)=\frac{x-81}{(x-81)(\sqrt{x}+9)}=\frac{1}{\sqrt{x}+9}=\frac{1}{18}$$

As "x approaches 81," the limit is $\frac{1}{18}$.

In the following example, you will simply substitute in the value of x and evaluate the limit.

$$\lim_{x\to 9}\sqrt{4x-3}=\sqrt{4(9)-3}=\sqrt{36-3}=\sqrt{33}$$

As "x approaches 9," the limit is $\sqrt{33}$.