Direct substitution

Polynomials, exponentials, sine, and cosine are examples of 'continuous' functions.

Their graphs have no holes or jumps, and can be drawn without lifting your pen.

Limits of these 'continuous' functions can be evaluated by direct substitution.

Also, a ratio of two continuous functions is continuous **IF** the denominator is nonzero.

EXAMPLE: Evaluate the following.

- $\lim\limits_{x \to 3} x^2 + 1$

- $\lim\limits_{x \to \pi} \sin(x/6)$

- $\lim\limits_{x \to 3} \dfrac{x - 2}{x + 3}$

Algebra for limits of quotients

A common type of limit problem involves a fraction where direct substitution gives you $0/0$.

If you get $0/0$, you **DON'T KNOW THE ANSWER YET**. Doing algebra might help.

EXAMPLE: Evaluate the following.

$$\lim_{x \to 1} \frac{x^2 - 1}{x - 1}$$

EXAMPLE: Evaluate the following.

$$\lim_{x \to 3} \frac{x^2 - 5x + 6}{x^2 - 9}$$