

# Solving with substitution

As we've seen in previous lessons, the simplest way to evaluate a limit is to substitute the value we're approaching into the function.

For instance, given the function  $f(x) = x + 1$ , finding the limit as  $x \rightarrow 5$  is as easy as substituting  $x = 5$  into  $f(x)$ .

$$\lim_{x \rightarrow 5} (x + 1)$$

$$5 + 1$$

$$6$$

If  $f(x)$  is an expression that contains only polynomials, roots, absolute values, exponentials, logarithms, trig or inverse trig functions, then we may be able to evaluate using substitution, and we'll have

$$\lim_{x \rightarrow a} f(x) = f(a)$$

But if the function is undefined at  $x = a$ , or if  $x = a$  is the transition point between two pieces of a piecewise-defined function, then we can't apply the substitution rule.

Nevertheless, when we evaluate a limit we should always try substitution first before any other technique, because it's the easiest and fastest method. If substitution doesn't work, then we can try evaluating the limit by a different method.



Let's look at another example where we use substitution to evaluate the limit.

### Example

Evaluate the limit.

$$\lim_{x \rightarrow -2} (x^2 + 2x + 6)$$

Since we're approaching  $x = -2$ , we'll substitute  $x = -2$  into the function.

$$(-2)^2 + 2(-2) + 6$$

$$4 - 4 + 6$$

$$6$$

So the limit of the function as  $x \rightarrow -2$  is 6.

