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 $x \to 5$ is as easy as substituting $x = 5$ into $f(x)$.

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

$$5 + 1$$

$$6$$

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

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

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.

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

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 $x \to -2$ is 6.