Exercise 106

Express the limit as a derivative and evaluate.

$$\lim_{x\to 1}\frac{x^{17}-1}{x-1}$$

Solution

Recall the definition of a derivative.

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

The function in question is

$$f(x)=x^{17}.$$

Take the derivative by using the power rule.

$$f'(x)=17x^{16}$$

Plug in $x=1$.

$$f'(1)=17(1)^{16}=17$$

Therefore,

$$\lim_{x\to 1}\frac{x^{17}-1}{x-1}=17.$$