

Chain rule

The *chain rule* is a formula for calculating the derivative of the composition of two (or more) functions. In function notation, it can be written as

$$(f \circ g)'(x) = f'(g(x))g'(x).$$

An alternative way of writing it is as follows. If y is a function of u , and u is a function of x , then

$$\frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx}.$$

For example, if $y = (x^2 + 3)^5$, then if we write $u = x^2 + 3$, we have $y = u^5$, so

$$\frac{dy}{dx} = 5u^4 \times 2x = 10x(x^2 + 3)^4.$$