

# Calculus

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# Basics

## Elementary Derivatives

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$f$	$C$	$x^n$	$\sin x$	$\cos x$	$a^x$	$\ln x$
$f'$	0	$nx^{n-1}$	$\cos x$	$-\sin x$	$a^x \ln a$	$\frac{1}{x}$

## Composition Laws

Let  $f$  and  $g$  be differentiable functions over  $x$ .

The  $'$  mark denotes the derivative with respect to  $x$ , so  $f' = \frac{df}{dx}$  and  $g' = \frac{dg}{dx}$ .

The  $\circ$  symbol denotes function composition, so  $(f \circ g)(x) = f(g(x))$ .

$$(f \pm g)' = f' \pm g'$$

$$(fg)' = fg' + f'g$$

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

$$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$$

# Integration

For integrals of the form on the left, consider the function on the right.

$\int k f' f^n \, dx$	$f^{n+1}$
$\int k \frac{f'}{f} \, dx$	$\ln  f $