11

Notable Derivatives

Generally, we do not need to compute this limit every time to determine the derivative of a function. The below table gives the derivatives of some general functions that you have already seen.

$f(x)$	df/dx
1	0
x^n	nx^{n-1}
$1/x$	$-1/x^2$
$x^{-n} = 1/x^n$	$-nx^{-(n+1)} = -n/x^{n+1}$
$\sin(x)$	$\cos(x)$
$\cos(x)$	$-\sin(x)$
e^x	e^x
$\ln(x)$	$1/x$

Table 11.1: Useful derivatives

An easy way to remember how to differentiate functions like x^2 and x^{-4} is the following:

Multiply by the power, and then bring the power down by one.

Example 11.1. Let $f, g : \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = x^4$ and $g(x) = x^{-6}$. Let us compute $f'(x)$ and $g'(x)$. We will use Table 11.1 to help.

- $f'(x) = \dfrac{d}{dx}(f(x)) = \dfrac{d}{dx}(x^4) = 4x^{4-1} = 4x^3$.

- $g'(x) = \dfrac{d}{dx}(g(x)) = \dfrac{d}{dx}(x^{-6}) = -6x^{-(6+1)} = -6x^{-7} = -\frac{6}{x^7}$.