Summary of differentiation rules

We can summarise the differentiation rules we have found as follows. They can be expressed in both functional and Leibniz notation. First, the linearity of differentiation.

Linearity of differentiation

	Functional notation	Leibniz notation
Constant multiple	$\frac{d}{dx}[cf(x)] = cf'(x)$	$\frac{d}{dx}(cf) = c\frac{df}{dx}$
Sum	$\frac{d}{dx}[f(x) + g(x)] = f'(x) + g'(x)$	$\frac{d}{dx}(f + g) = \frac{df}{dx} + \frac{dg}{dx}$
Difference	$\frac{d}{dx}[f(x) - g(x)] = f'(x) - g'(x)$	$\frac{d}{dx}(f - g) = \frac{df}{dx} - \frac{dg}{dx}$

We also have the product, quotient and chain rules. In Leibniz notation, these rules are often written with *u*,*v* rather than *f* ,*g*.

Product, quotient and chain rules

	Functional notation	Leibniz Notation
Product	$\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + f'(x)g(x)$	$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$
Quotient	$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(X)f'(x) - f(x)g'(x)}{(g(x))^2}$	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$
Chain	$\frac{d}{dx}[f(g(x))] = f'(g(x)g'(x)$	$\frac{dy}{dx} = \frac{dy}{du}\frac{du}{dx}$