Derivatives and Antiderivatives: Quick Reference Handout

Side-by-side rules of derivatives and antiderivatives helps you see the relationship between the two processes.
From Lumen textbook by Callaway.

Derivative Rules: Building Blocks

In what follows, *f* and *g* are differentiable functions of *x* and *k* and *n* are constants.

(a) **Constant Multiple Rule:** $\frac{d}{dx}(kf) = kf'$

(b) **Sum (or Difference) Rule:** $\frac{d}{dx}(f+g) = f'+g'$ **(or** $\frac{d}{dx}(f-g) = f'-g'$**)**

(c) **Power Rule:** $\frac{d}{dx}(x^n) = nx^{n-1}$

Special cases: $\frac{d}{dx}(k) = 0$ (because $k = kx^0$)

$\frac{d}{dx}(x) = 1$ (because $x = x^1$)

(d) **Exponential Functions:** $\frac{d}{dx}(e^x) = e^x$

$\frac{d}{dx}(a^x) = \ln a \cdot a^x$

(e) **Natural Logarithm:** $\frac{d}{dx}(\ln x) = \frac{1}{x}$

Antiderivative Rules: Building Blocks

In what follows, *f* and *g* are differentiable functions of *x* and *k*, *n*, and *C* are constants.

(a) **Constant Multiple Rule:** $\int kf(x)\,dx = k\int f(x)dx$

(b) **Sum (or Difference) Rule:** $\int f(x) \pm g(x)dx = \int f(x)dx \pm \int f(x)dx$

(c) **Power Rule:** $\int x^n\,dx = \frac{x^{n+1}}{n+1} + C$, provided that $n = -1$

Special case: $\int k\,dx = kx + C$ (because $k = kx^0$)

(d) **Exponential Functions:** $\int e^x\,dx = e^x + C$

$\int a^x\,dx = \frac{a^x}{\ln a} + C$

(e) **Natural Logarithm:** $\int x^{-1}\,dx = \int \frac{1}{x}dx = \ln|x| + C$