Some basic derivatives:

$f(x)$	$f'(x)$	$f(x)$	$f'(x)$
x^n	nx^{n-1}	e^x	e^x
$\ln(x)$	$1/x$	$\sin(x)$	$\cos(x)$
$\cos(x)$	$-\sin(x)$	$\tan(x)$	$\sec^2(x)$
$\cot(x)$	$-\mathrm{cosec}^2(x)$	$\sec(x)$	$\sec(x)\tan(x)$
$\mathrm{cosec}(x)$	$-\mathrm{cosec}(x)\cot(x)$	$\tan^{-1}(x)$	$1/(1+x^2)$
$\sin^{-1}(x)$	$1/\sqrt{1-x^2}$ for $\lvert x\rvert<1$	$\cos^{-1}(x)$	$-1/\sqrt{1-x^2}$ for $\lvert x\rvert<1$
$\sinh(x)$	$\cosh(x)$	$\cosh(x)$	$\sinh(x)$
$\tanh(x)$	$\mathrm{sech}^2(x)$	$\coth(x)$	$-\mathrm{cosech}^2(x)$
$\mathrm{sech}(x)$	$-\mathrm{sech}(x)\tanh(x)$	$\mathrm{cosech}(x)$	$-\mathrm{cosech}(x)\coth(x)$
$\sinh^{-1}(x)$	$1/\sqrt{x^2+1}$	$\cosh^{-1}(x)$	$1/\sqrt{x^2-1}$ for $x>1$
$\tanh^{-1}(x)$	$1/(1-x^2)$ for $\lvert x\rvert<1$	$\coth^{-1}(x)$	$-1/(x^2-1)$ for $\lvert x\rvert>1$

Basic rules for differentiation and integration:

- $\frac{\mathrm{d}}{\mathrm{d}x}\big(f(x)+g(x)\big) = \frac{\mathrm{d}}{\mathrm{d}x}f(x) + \frac{\mathrm{d}}{\mathrm{d}x}g(x) = f'(x)+g'(x)$ ***derivative of a sum***
- $\frac{\mathrm{d}}{\mathrm{d}x}\big(cf(x)\big) = c\,\frac{\mathrm{d}}{\mathrm{d}x}f(x) = cf'(x)$ ***derivative with a constant factor***
- $\frac{\mathrm{d}}{\mathrm{d}x}\big(f(x)g(x)\big) = f(x)g'(x)+f'(x)g(x)$ ***derivative of a product***
  "first times derivative of second plus second times derivative of first"
- $\dfrac{\mathrm{d}}{\mathrm{d}x}\dfrac{f(x)}{g(x)} = \dfrac{g(x)f'(x)-f(x)g'(x)}{g^2(x)}$ ***derivative of a quotient***
  "bottom times derivative of top minus top times derivative of bottom, over bottom squared"
- $\frac{\mathrm{d}}{\mathrm{d}x}f\big(g(x)\big) = f'\big(g(x)\big)g'(x)$ ***chain rule, or function of a function rule***
  "derivative of the outer function times derivative of the inner function"
- $\frac{\mathrm{d}}{\mathrm{d}x}f(ax+b) = af'(ax+b)$ ***special case of the chain rule***
- $\int f'(ax+b)\,\mathrm{d}x = \frac{1}{a}f(ax+b)+C$ ***integral of a function of a linear function***
- $\int f'\big(g(x)\big)g'(x)\,\mathrm{d}x = f\big(g(x)\big)+C$ ***integral of a chain-rule derivative***
- $\int \big(f(x)+g(x)\big)\,\mathrm{d}x = \int f(x)\,\mathrm{d}x + \int g(x)\,\mathrm{d}x$ ***integral of a sum***
- $\int cf(x)\,\mathrm{d}x = c\int f(x)\,\mathrm{d}x$ ***integral with a constant factor***
- $\int f(x)g'(x)\,\mathrm{d}x = f(x)g(x) - \int f'(x)g(x)\,\mathrm{d}x$ ***integration by parts***

"one part times integral of other, minus integral of derivative of the one times integral of other"

Some basic integrals:

$f(x)$	$\int f(x)\,\mathrm{d}x$
e^x	$e^x + C$
x^n for $n \neq -1$	$\dfrac{x^{n+1}}{n+1} + C$
$1/x$ for $x \neq 0$	$\ln\lvert x\rvert + C$
a^x or $e^{x\ln(a)}$ for $a \neq 1,\ a > 0$	$\dfrac{a^x}{\ln(a)} + C$
e^{ax} for $a \neq 0$	$\dfrac{e^{ax}}{a} + C$
$\cos(ax)$ for $a \neq 0$	$\dfrac{1}{a}\sin(ax) + C$
$\sin(ax)$ for $a \neq 0$	$-\dfrac{1}{a}\cos(ax) + C$
$\dfrac{1}{x^2+a^2}$ for $a \neq 0$	$\dfrac{1}{a}\tan^{-1}(x/a) + C$
$\dfrac{1}{a^2-x^2}$ for $\lvert x\rvert < \lvert a\rvert,\ a \neq 0$	$\dfrac{1}{a}\tanh^{-1}(x/a) + C$
$\dfrac{1}{x^2-a^2}$ for $\lvert x\rvert > \lvert a\rvert,\ a \neq 0$	$-\dfrac{1}{a}\coth^{-1}(x/a) + C$
$\dfrac{1}{x^2-a^2}$ for $\lvert x\rvert \neq \lvert a\rvert,\ a \neq 0$	$\dfrac{1}{2a}\ln\left\lvert\dfrac{x-a}{x+a}\right\rvert + C$
$\dfrac{1}{\sqrt{x^2+a^2}}$ for $a \neq 0$	$\sinh^{-1}(x/a) + C$
$\dfrac{1}{\sqrt{a^2-x^2}}$ for $\lvert x\rvert < a,\ a > 0$	$\sin^{-1}(x/a) + C$
$\dfrac{1}{\sqrt{x^2-a^2}}$ for $x > a,\ a > 0$	$\cosh^{-1}(x/a) + C$
$\dfrac{1}{\sqrt{x^2-a^2}}$ for $x < -a,\ a > 0$	$-\cosh^{-1}(-x/a) + C$

definite integral: $\displaystyle\int_a^b f(x)\,\mathrm{d}x = -\int_b^a f(x)\,\mathrm{d}x$

$$\int_a^b f'(x)\,\mathrm{d}x = \big[f(x)\big]_a^b = \lim_{x\to b^-} f(x) - \lim_{x\to a^+} f(x)$$

provided $f'(x)$ is continuous for all $a < x < b$.

substitution: $\displaystyle\int f(x)\,\mathrm{d}x = \int f\big(x(u)\big)\,\frac{\mathrm{d}x}{\mathrm{d}u}\,\mathrm{d}u$ ***indefinite integral***

$$\int_a^b f(x)\,\mathrm{d}x = \int_{u(a)}^{u(b)} f\big(x(u)\big)\,\frac{\mathrm{d}x}{\mathrm{d}u}\,\mathrm{d}u$$ ***definite integral***

integration by parts:

$$\int f(x)g'(x)\,\mathrm{d}x = f(x)g(x) - \int f'(x)g(x)\,\mathrm{d}x$$ ***indefinite integral***

$$\int_a^b f(x)g'(x)\,\mathrm{d}x = \big[f(x)g(x)\big]_a^b - \int_a^b f'(x)g(x)\,\mathrm{d}x$$ ***definite integral***