Derivatives

Common Derivatives

Name	Function	Derivative
Constant	c	0
Linear	x	1
	ax	a
Square	x^2	$2x$
Square Root	$\sqrt{x}$	$\frac{1}{2} \cdot x^{\frac{1}{2}}$
Exponential	e^x	e^x
	a^x	$\ln(a)\, a^x$
Logarithms	$\ln(x)$	$\frac{1}{x}$
	$\log_a(x)$	$\frac{1}{x \ln(a)}$
Trigonometry	$\sin(x)$	$\cos(x)$
	$\cos(x)$	$-\sin(x)$
	$\tan(x)$	$\sec^2(x)$
	$\cot(x)$	$-\csc^2(x)$
	$\sec(x)$	$\sec(x)\tan(x)$

Special Derivative Rules

Rule	Function	Derivative
Multiply by Constant	cf	cf'
Power Rule	x^n	nx^{n-1}
Sum Rule	$f+g$	$f'+g'$
Product Rule	fg	$fg'+gf'$
Quotient Rule	$\frac{f}{g}$	$\frac{gf'-fg'}{g^2}$
Reciprocal Rule	$\frac{1}{f}$	$-\frac{f'}{f^2}$
Chain Rule (Notation 1)	$f \circ g$	$(f' \circ g) \cdot g'$
Chain Rule (Notation 2)	$f(g(x)$	$f'(g(x)) \cdot g'(x)$

Integration

Common Integrals

Name	Function	Integral
Constant	$\int a\,dx$	$ax + C$
Variable	$\int x\,dx$	$\frac{x^2}{2} + C$
Reciprocal	$\int \frac{1}{x}\,dx$	$\ln\lvert x\rvert + C$
Exponential	$\int e^x\,dx$	$e^x + C$
Trig	$\int \cos(x)\,dx$	$\sin(x) + C$
	$\int \sin(x)\,dx$	$-\cos(x) + C$
	$\int \sec^2(x)\,dx$	$\tan(x) + C$

Integration by Parts

$$\int u\, dv = uv - \int v\, du$$

For Integration by Parts, Pick u and dv from your equation.

$u =$ _____ $dv =$ _____ $\leftarrow$ pick these.
$du =$ _____ $v =$ _____ $\leftarrow$ derive from above.

Integration by Substitution

When you notice an equation that could be in the form:

$$\int f(g(x))\, g'(x)\, dx$$

1. Choose a transformation
$$u = g(x)$$
2. Find its differential
$$du = g'(x)\, dx$$
3. Apply substitution
$$\int f(g(x))\, g'(x)\, dx = \int f(u)\, du$$
4. Solve the Integral, and then replace u again.