Basic Trigonometric Integrals

$\int \sin(x)dx$	**$-\cos(x)+C$**
$\int \cos(x)dx$	**$\sin(x)+C$**
$\int \sec^2(x)dx$	**$\tan(x)+C$**
$\int \sec(x)\tan(x)dx$	**$\sec(x)+C$**
$\int \csc^2(x)dx$	$-\cot(x)+C$
$\int \csc(x)\cot(x)dx$	$-\csc(x)+C$

Common Trigonometric Integrals

$\int \sin(2x)dx$	**$-\frac{1}{2}\cos(2x)+C$**
$\int \cos(2x)dx$	**$\frac{1}{2}\sin(2x)+C$** = $\sin(x)\cos(x)+C$
$\int \tan(x)dx$	$\ln\lvert\sec(x)\rvert+C$
$\int \sec(x)dx$	$\ln\lvert\sec(x)+\tan(x)\rvert+C$
$\int \sec^3(x)dx$	$\frac{1}{2}(\sec(x)\tan(x)+\ln\lvert\sec(x)+\tan(x)\rvert)+C$
$\int \csc(x)dx$	$-\ln\lvert\csc(x)+\cot(x)\rvert+C$
$\int \csc^3(x)dx$	$-\frac{1}{2}(\csc(x)\cot(x)+\ln\lvert\csc(x)+\cot(x)\rvert)+C$
$\int 1/(1+x^2)dx$	**$\arctan(x)+C$**
$\int 1/(a^2+x^2)dx$	$(1/a)\arctan(x/a)+C$

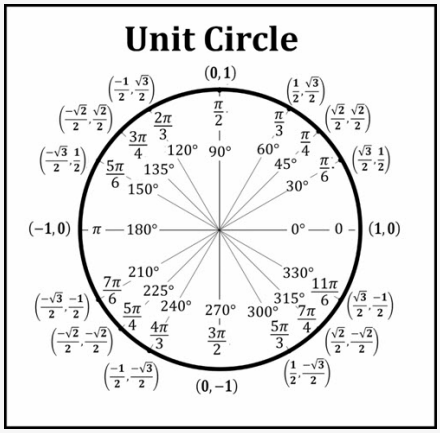
Secant and Cosecant Integral Forms

Secant Integral 1	$\int \sec(x)dx = \ln\lvert\sec(x)+\tan(x)\rvert+C$
Secant Integral 2	$\int \sec(x)dx = -\ln\lvert\sec(x)-\tan(x)\rvert+C$
Secant Integral 3	$\int \sec(x)dx = \frac{1}{2}\ln\lvert(\sin(x)+1)/(\sin(x)-1)\rvert+C$
Secant Integral 4	$\int \sec(x)dx = \ln\lvert\tan(x/2+\pi/4)\rvert+C$

Secant and Cosecant Integral Forms (cont)

Cosecant Integral 1	$\int \csc(x)dx = -\ln\lvert\csc(x)+\cot(x)\rvert+C$
Cosecant Integral 2	$\int \csc(x)dx = \ln\lvert\csc(x)-\cot(x)\rvert+C$
Cosecant Integral 3	$\int \csc(x)dx = \frac{1}{2}\ln\lvert(\cos(x)-1)/(\cos(x)+1)\rvert+C$
Cosecant Integral 4	$\int \csc(x)dx = \ln\lvert\tan(x/2)\rvert+C$

Sine and Cosine Unit Circle



Powers of Trigonometric Functions

https://cheatography.com/crossant/cheat-sheets/integral-cases-for-trigonometric-powers/

Quotient and Reciprocal Identities

Tangent Quotient	**$\tan(x)=\sin(x)/\cos(x)$**
Cotangent Quotient	**$\cot(x)=\cos(x)/\sin(x)$**
Sine Reciprocal	$\sin(x)=1/\csc(x)$
Cosine Reciprocal	$\cos(x)=1/\sec(x)$
Tangent Reciprocal	$\tan(x)=1/\cot(x)$
Cosecant Reciprocal	**$\csc(x)=1/\sin(x)$**
Secant Reciprocal	**$\sec(x)=1/\cos(x)$**
Cotangent Reciprocal	$\cot(x)=1/\tan(x)$

Pythagorean Identities

Sine-Cosine Pythagorean	**$\sin^2(x)+\cos^2(x)=1$**
Sine Pythagorean	**$\sin^2(x)=1-\cos^2(x)$**
Cosine Pythagorean	**$\cos^2(x)=1-\sin^2(x)$**
Secant Pythagorean	**$\tan^2(x)+1=\sec^2(x)$**
Tangent Pythagorean	**$\tan^2(x)=\sec^2(x)-1$**
Secant-Tangent Pythagorean	$\sec^2(x)-\tan^2(x)=1$
Cosecant Pythagorean	$1+\cot^2(x)=\csc^2(x)$
Cotangent Pythagorean	$\cot^2(x)=\csc^2(x)-1$
Cosecant-Cotangent Pythagorean	$\csc^2(x)-\cot^2(x)=1$

The last two triplets of Pythagorean identities are obtained by dividing all the terms of the original identity by $\sin^2(x)$ or $\cos^2(x)$

Sum, Difference, and Product Identities

$\sin(x+y)=\sin(x)\cos(y) + \cos(x)\sin(y)$

$\sin(x-y)=\sin(x)\cos(y) - \cos(x)\sin(y)$

$\cos(x+y)=\cos(x)\cos(y) - \sin(x)\sin(y)$

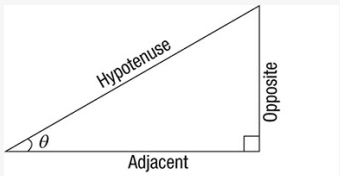
$\cos(x-y)=\cos(x)\cos(y) + \sin(x)\sin(y)$

$\sin(x)\sin(y)=\frac{1}{2}(\cos(x-y) - \cos(x+y))$

$\cos(x)\cos(y)=\frac{1}{2}(\cos(x+y) + \cos(x-y))$

$\sin(x)\cos y)=\frac{1}{2}(\sin(x+y) + \sin(x-y))$

Right-Triangle Trigonometric Relations



$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$ $\csc\theta = \frac{\text{hypotenuse}}{\text{opposite}}$

$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$ $\sec\theta = \frac{\text{hypotenuse}}{\text{adjacent}}$

$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$ $\cot\theta = \frac{\text{adjacent}}{\text{opposite}}$

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Trigonometric Substitutions

a^2-u^2	**Let u=asin(θ), du=acos(θ)dθ**	θ∈[-π/2, π/2]
u^2-a^2	**Let u=asec(θ), du=asec(θ)tan(θ)dθ**	θ∈[0, π/2)
u^2+a^2	**Let u=atan(θ), du=asec^2(θ)dθ**	θ∈(-π/2, π/2)
a^2-b^2u^2	Let u=(a/b)sin(θ), du=(a/b)cos(θ)dθ	θ∈[-π/2, π/2]
b^2u^2-a^2	Let u=(a/b)sec(θ), du=(a/b)sec(θ)tan(θ)dθ	θ∈[0, π/2)
b^2u^2+a^2	Let u=(a/b)tan(θ), du=(a/b)sec^2(θ)dθ	θ∈(-π/2, π/2)

Trigonometric substitutions are typically used under radicals, however, they are not required to be

For definite integrals, you will need to set u equal to its respective bounds, and solve for θ in order to properly change the bounds of integration with respect to θ

Half-Angle and Double-Angle Identities

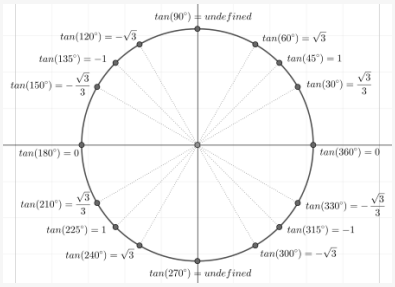
Sine Half-Angle	sin(x/2)=√(½(1-cos(x)))
Cosine Half-Angle	cos(x/2)=√(½(1+cos(x)))
Sine Power-Reducing	**sin^2(x)=½(1-cos(2x))**
Cosine Power-Reducing	**cos^2(x)=½(1+cos(2x))**
Sine Double-Angle	**sin(2x)=2sin(x)cos(x)**
Cosine Double-Angle 1	**cos(2x)=cos^2(x)-sin^2(x)**
Cosine Double-Angle 2	cos(2x)=2cos^2(x)-1

Half-Angle and Double-Angle Identities (cont)

Cosine Double-Angle 3	cos(2x)=1-2sin^2(x)

Sine Power-Reducing and Cosine Power--Reducing identities are variations of the Half-Angle identities

Tangent Unit Circle



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