FORMULAS

The slope of the tangent line to the parametric curve $x = f(t)$, $y = g(t)$ is ...	$\dfrac{dy}{dx} = \dfrac{dy/dt}{dx/dt}$
Parametric equations for a line through the point (x_0, y_0) with slope a/b:	$x = x_0 + bt,\ y = y_0 + at$

Conversions (rectangular $\leftrightarrow$ polar)	Polar calculus for $r = f(\theta)$
$x = r\cos\theta$	$\dfrac{dy}{dx} = \dfrac{dy/d\theta}{dx/d\theta}$
$y = r\sin\theta$	$L = \int_\alpha^\beta \sqrt{[f(\theta)]^2 + [f'(\theta)]^2}\ d\theta$
$x^2 + y^2 = r^2$	$A = \int_\alpha^\beta \frac{1}{2}[f(\theta)]^2\, d\theta$
$\tan\theta = \dfrac{y}{x}$	

$\sin^2\theta + \cos^2\theta = 1$	$\tan^2\theta + 1 = \sec^2\theta$	$\cos 2\theta = 2\cos^2\theta - 1 = 1 - 2\sin^2\theta$
$\sin^2\theta = \frac{1}{2}(1 - \cos 2\theta)$	$\cos^2\theta = \frac{1}{2}(1 + \cos 2\theta)$	$\sin 2\theta = 2\sin\theta\cos\theta$

IBP: $\int u dv = uv - \int v du$	$\int \ln x\ dx = x\ln x - x + C$
$\int \tan x\ dx = \ln\lvert\sec x\rvert + C$	$\int \tan^n x\ dx = \frac{\tan^{n-1} x}{n-1} - \int \tan^{n-2} x\ dx\ (n \neq 1)$
$\int \sec x\ dx = \ln\lvert\sec x + \tan x\rvert + C$	$\int \sec^n x\ dx = \frac{\sec^{n-2} x \tan x}{n-1} + \frac{n-2}{n-1}\int \sec^{n-2} x\ dx\ (n \neq 1)$

$V = \int_a^b A(x)\ dx$	$V = \int_a^b \pi\left(f(x)^2 - g(x)^2\right)\ dx$	$V = \int_a^b 2\pi x\,(f(x) - g(x))\ dx$
$L = \int_a^b \sqrt{1 + [f'(x)]^2}\ dx$	$A = \int_a^b \lvert f(x) - g(x)\rvert\ dx$	$SA = \int_a^b 2\pi f(x)\sqrt{1 + [f'(x)]^2}\ dx$
$W = \int_a^b F(x)\ dx$	$W = \int_a^b \rho g A(y) D(y)\ dy$	

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$\int \sin^m x \cos^n x \; dx$	Strategy
If n is odd and positive ...	... keep $\cos x \; dx$, rewrite everything else in terms of $\sin x$, then sub in $u = \sin x$ (with $du = \cos x \; dx$)
If m is odd and positive ...	... keep $\sin x \; dx$, rewrite everything else in terms of $\cos x$, then sub in $u = \cos x$ (with $(-1)du = \sin x \; dx$)
If m and n are both even non-negative integers ...	... use half-angle formulas to convert to $\cos 2x$ and refer back to this table

$\int \tan^m x \sec^n x \; dx$	Strategy
If n is even and positive ...	... keep $\sec^2 x \; dx$, rewrite everything else in terms of $\tan x$, then sub in $u = \tan x$ (with $du = \sec^2 x \; dx$)
If m is odd ...	... keep $\tan x \sec x \; dx$, rewrite everything else in terms of $\sec x$, then sub in $u = \sec x$ (with $du = \tan x \sec x \; dx$)
If m is even and n is odd ...	... rewrite everything in terms of $\sec x$ and apply a reduction formula
If you want ...	... convert to $\sin x$ and $\cos x$ and see the other table

The integral contains ...	Substitution	Trig identity
$a^2 - x^2$	$x = a \sin\theta$ and $dx = a\cos\theta \; d\theta$	$a^2 - a^2 \sin^2\theta = a^2 \cos^2\theta$
$a^2 + x^2$	$x = a \tan\theta$ and $dx = a\sec^2\theta \; d\theta$	$a^2 + a^2 \tan^2\theta = a^2 \sec^2\theta$
$x^2 - a^2$	$x = a \sec\theta$ and $dx = a\tan\theta \sec\theta \; d\theta$	$a^2 \sec^2\theta - a^2 = a^2 \tan^2\theta$