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Trigonometric Ratios

$\sin(-A) = -\sin A$ (Odd Func^n)

$\cos(-A) = \cos A$ (Even Func^n)

$\sin(A+B) = \sin A \cdot \cos B + \cos A \cdot \sin B$

$\sin(A-B) = \sin A \cdot \cos B - \cos A \cdot \sin B$

$\cos(A+B) = \cos A \cdot \cos B - \sin A \cdot \sin B$

$\cos(A-B) = \cos A \cdot \cos B + \sin A \cdot \sin B$

$2\sin A \cdot \cos B = \sin(A+B) + \sin(A-B)$

$2\sin A \cdot \sin B = \cos(A-B) - \cos(A+B)$

$2\cos A \cdot \sin B = \sin(A+B) - \sin(A-B)$

$2\cos A \cdot \cos B = \cos(A+B) + \cos(A-B)$

$\sin C + \sin D = 2\sin\left(\frac{C+D}{2}\right) \cdot \cos\left(\frac{C-D}{2}\right)$

$\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right) \cdot \sin\left(\frac{C-D}{2}\right)$

$\cos C + \cos D = 2\cos\left(\frac{C+D}{2}\right) \cdot \cos\left(\frac{C-D}{2}\right)$

$\cos C - \cos D = -2\sin\left(\frac{C+D}{2}\right) \cdot \sin\left(\frac{C-D}{2}\right)$

$\sin 2A = 2\sin A \cdot \cos A$

$\cos 2A = \cos^2 A - \sin^2 A$

$1 + \sin 2A = (\cos A + \sin A)^2$

$1 - \sin 2A = (\cos A - \sin A)^2$

$1 + \cos A = 2\cos^2\left(\frac{A}{2}\right)$

$1 - \cos A = 2\sin^2\left(\frac{A}{2}\right)$

$\sin 3A = 3\sin A - 4\sin^3 A$

$\cos 3A = 4\cos^3 A - 3\cos A$

$\tan 3A = \frac{3\tan A - \tan^3 A}{1 - 3\tan^2 A}$

$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$

Complex Formulae

$\sin A = \frac{e^{iA} - e^{-iA}}{2i}$ $\qquad \cos A = \frac{e^{iA} + e^{-iA}}{2}$

$\sinh A = \frac{e^{A} - e^{-A}}{2}$ $\qquad \cosh A = \frac{e^{A} + e^{-A}}{2}$

$e^{iA} = \cos A + i\sin A$ $\qquad e^{-iA} = \cos A - i\sin A$

Derivatives

$\frac{d}{dx}(x^n) = n\,x^{n-1}$

$\frac{d}{dx}(\sin x) = \cos x$

$\frac{d}{dx}(\cos ax) = -a\sin ax$

$\frac{d}{dx}(\tan x) = \sec^2 x$

$\frac{d}{dx}(e^{ax}) = a\,e^{ax}$

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

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

$\frac{d}{dx}(1) = 0$

Integration

$\int x^n\,dx = \frac{x^{n+1}}{n+1} + c$

$\int \sin x\,dx = -\cos x + c$

$\int \cos ax\,dx = \frac{\sin ax}{a} + c$

$\int e^{ax}\,dx = \frac{e^{ax}}{a} + c$

$\int \frac{f'(x)}{f(x)}\,dx = \log|f(x)| + c$

$\int \frac{1}{\sqrt{a^2-x^2}}\,dx = \sin^{-1}\left(\frac{x}{a}\right) + c$

$\int \frac{-1}{\sqrt{a^2-x^2}}\,dx = \cos^{-1}\left(\frac{x}{a}\right) + c$

$\int \frac{1}{a^2+x^2}\,dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + c$

$\int \frac{1}{x^2-a^2}\,dx = \frac{1}{2a}\log\left|\frac{x-a}{x+a}\right| + c$

$\int \frac{1}{a^2-x^2}\,dx = \frac{1}{2a}\log\left|\frac{a+x}{a-x}\right| + c$

$\int \frac{1}{\sqrt{x^2+a^2}}\,dx = \log\left|x + \sqrt{x^2+a^2}\right| + c$

$\int \frac{1}{\sqrt{x^2-a^2}}\,dx = \log\left|x + \sqrt{x^2-a^2}\right| + c$

$\int \tan x\,dx = \log|\sec x|$

$\int \cot x\,dx = \log|\sin x|$

$\int \sec x\,dx = \log(\sec x + \tan x)$

$\int \mathrm{cosec}\,x\,dx = \log(\mathrm{cosec}\,x - \cot x)$

$\int \sqrt{x^2+a^2}\,dx = \frac{x}{2}\sqrt{x^2+a^2} + \frac{a^2}{2}\log\left|x + \sqrt{x^2+a^2}\right| + c$

$\int \sqrt{x^2-a^2}\,dx = \frac{x}{2}\sqrt{x^2-a^2} - \frac{a^2}{2}\log\left|x + \sqrt{x^2-a^2}\right| + c$

$\int \sqrt{a^2-x^2}\,dx = \frac{x}{2}\sqrt{a^2-x^2} + \frac{a^2}{2}\sin^{-1}\left(\frac{x}{a}\right) + c$

$\int e^{ax}\sin bx\,dx = \frac{e^{ax}}{a^2+b^2}[a\sin bx - b\cos bx] + c$

$\int e^{ax}\cos bx\,dx = \frac{e^{ax}}{a^2+b^2}[a\cos bx + b\sin bx] + c$

More Basics

$\log a^b = b\log a$

$\log\left(\frac{AB}{C}\right) = \log A + \log B - \log C$

$\int 1\,dx = x + c$

$\int 1\,dt = t + c$

$\int 0\,dx = 0 + c$

$\frac{1}{0} = \infty \qquad \frac{(Anything)}{0} = \infty$ [only for $1^{(Anything)} = 1$] $\qquad 1^{(0)} = 1^{(\infty)} = 1^{(-\infty)} = 1$

$\frac{1}{\infty} = 0 \qquad \frac{(Anything)}{\infty} = 0 \qquad (1<)(Anything)^{\infty} = \infty \qquad (1>)(Anything)^{\infty} = 0$

$Anything^{(0)} = 1 \qquad (1<)(Anything)^{-\infty} = 0 \qquad (1>)(Anything)^{-\infty} = \infty$

$|M| = \sqrt{(R)^2 + (I)^2} \qquad \int ABCD\,dx = ABCD\int 1\,dx = ABCD \cdot x + c$

$|z| = |\bar{z}| = \sqrt{(x)^2 + (y)^2} \qquad \int ABCD\,dA = BCD\int A\,dA = BCD\,\frac{A^2}{2} + c$

z is a point & $|z|$ = Circle

$z = x + iy$, $\bar{z} = x - iy$ (Cartesian form) where $x = r\cos A$, $y = r\sin A$

$z = r(\cos A + i\sin A)$ [Polar form] $\quad z = r\,e^{iA}$ [Exponential form]

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