FORMULAS

$t_n = a + (n-1)d$	$S_n = [a + t_n](n/2)$
$t_n = a\,r^{n-1}$	$S_n = a\left\|\frac{r^n - 1}{r - 1}\right\|$
$1 + 1 + 1 + \cdots n\ times = n$	$1 + 2 + 3 + \cdots n = (n/2)(n+1)$
$1^2 + 2^2 + 3^2 + \cdots n^2 = (n/6)(n+1)(2n+1)$	$1^3 + 2^3 + 3^3 + \cdots n^3 = [(n/2)(n+1)]^2$

$\sin^2\theta + \cos^2\theta = 1$	$\sec^2\theta - \tan^2\theta = 1$	$\operatorname{cosec}^2\theta - \cot^2\theta = 1$
$\sin 2\theta = \frac{2\tan\theta}{1 + \tan^2\theta}$	$\cos 2\theta = \frac{1 - \tan^2\theta}{1 + \tan^2\theta}$	$\tan 2\theta = \frac{2\tan\theta}{1 - \tan^2\theta}$
$\sin 3\theta = 3\sin\theta - 4\sin^3\theta$	$\cos 3\theta = 4\cos^3\theta - 3\cos\theta$	$\tan 3\theta = \frac{3\tan\theta - \tan^3\theta}{1 - 3\tan^2\theta}$
$\sin^2\theta = \frac{1 - \cos 2\theta}{2}$	$\cos^2\theta = \frac{1 + \cos 2\theta}{2}$	$\tan^2\theta = \frac{1 - \cos 2\theta}{1 + \cos 2\theta}$

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

$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$	$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$
$\sin(\alpha + \beta)\sin(\alpha - \beta) = \sin^2\alpha - \sin^2\beta$	$\cos(\alpha + \beta)\cos(\alpha - \beta) = \cos^2\alpha - \sin^2\beta$
$\tan(\alpha \pm \beta) = \frac{\tan\alpha \pm \tan\beta}{1 \mp \tan\alpha\tan\beta}$	$\cot(\alpha \pm \beta) = \frac{\cot\alpha\cot\beta \mp 1}{\cot\beta \pm \cot\alpha}$

$2\sin\alpha\cos\beta = \sin(\alpha + \beta) + \sin(\alpha - \beta)$	$\sin A + \sin B = 2\sin\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)$
$2\cos\alpha\sin\beta = \sin(\alpha + \beta) - \sin(\alpha - \beta)$	$\sin A - \sin B = 2\cos\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right)$
$2\cos\alpha\cos\beta = \cos(\alpha + \beta) + \cos(\alpha - \beta)$	$\cos A + \cos B = 2\cos\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)$
$2\sin\alpha\sin\beta = -\cos(\alpha + \beta) + \cos(\alpha - \beta)$	$\cos A - \cos B = -2\sin\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right)$

FUNCTION	DOMAIN	CO-DOMAIN	FUNCTION	DOMAIN	CO-DOMAIN
sin	R	$[-1,1]$	$\sin^{-1}$	$[-1,1]$	$[-\pi/2, \pi/2]$
cos	R	$[-1,1]$	$\cos^{-1}$	$[-1,1]$	$[0, \pi]$
tan	$R - \{(2K+1)\pi/2\}$	R	$\tan^{-1}$	R	$(-\pi/2, \pi/2)$
cot	$R - \{K\pi\}$	R	$\cot^{-1}$	R	$(0, \pi)$
sec	$R - \{(2K+1)\pi/2\}$	$R - (-1,1)$	$\sec^{-1}$	$R - (-1,1)$	$[0, \pi] - \{\pi/2\}$
cosec	$R - \{K\pi\}$	$R - (-1,1)$	$\operatorname{cosec}^{-1}$	$R - (-1,1)$	$[-\pi/2, \pi/2] - \{0\}$

FUNCTION	PERIOD	ROOTS	FUNCTION	PERIOD	ROOTS
sin	2π	$K\pi$	cosec	2π	$\emptyset$
cos	2π	$(2K+1)\pi/2$	sec	2π	$\emptyset$
tan	π	$K\pi$	cot	π	$(2K+1)\pi/2$

$\sin^{-1} -x = -\sin^{-1} x, \|x\| \le 1$	$\cos^{-1} -x = \pi - \cos^{-1} x, \|x\| \le 1$	$\tan^{-1} -x = -\tan^{-1} x, x \in R$
$\operatorname{cosec}^{-1} -x = -\operatorname{cosec}^{-1} x, \|x\| \ge 1$	$\sec^{-1} -x = \pi - \sec^{-1} x, \|x\| \ge 1$	$\cot^{-1} -x = \pi - \cot^{-1} x, x \in R$

$\sin^{-1} x = \operatorname{cosec}^{-1}(1/x), Where\ x \in [-1,1] - \{0\}$	$\operatorname{cosec}^{-1} x = \sin^{-1}(1/x), Where\ \|x\| \ge 1$	
$\cos^{-1} x = \sec^{-1}(1/x), Where\ x \in [-1,1] - \{0\}$	$\sec^{-1} x = \cos^{-1}(1/x), Where\ \|x\| \ge 1$	
$for\ x > 0$	$\tan^{-1} x = \cot^{-1}(1/x)$	$\cot^{-1} x = \tan^{-1}(1/x)$
$for\ x < 0$	$\tan^{-1} x = \cot^{-1}(1/x) - \pi$	$\cot^{-1} x = \tan^{-1}(1/x) + \pi$

$\sin^{-1} x + \cos^{-1} x = \pi/2, \|x\| \le 1$	$\operatorname{cosec}^{-1} x + \sec^{-1} x = \pi/2, \|x\| \ge 1$	$\tan^{-1} x + \cot^{-1} x, x \in R$
$\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left(\frac{x+y}{1-xy}\right), xy < 1$	$\tan^{-1} x + \tan^{-1} y = \pi + \tan^{-1}\left(\frac{x+y}{1-xy}\right), xy > 1$	
$\tan^{-1} x - \tan^{-1} y = \tan^{-1}\left(\frac{x-y}{1+xy}\right)$	$\tan^{-1} x + \tan^{-1} y = \frac{\pi}{2}, x = y$	

$0 < x < 1$	$\sin^{-1} x = \cos^{-1}\sqrt{1-x^2} = \tan^{-1}\left(x/\sqrt{1-x^2}\right)$
$0 < x < 1$	$\cos^{-1} x = \sin^{-1}\sqrt{1-x^2} = \tan^{-1}\left(\sqrt{1-x^2}/x\right)$
$x > 0$	$\tan^{-1} x = \cos^{-1}\left(1/\sqrt{1+x^2}\right) = \sin^{-1}\left(x/\sqrt{1+x^2}\right)$

$Sin\ Rule\colon \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C} = 2R$	$\cos A = \dfrac{b^2+c^2-a^2}{2bc}$	$\cos B = \dfrac{a^2+c^2-b^2}{2ac}$	$\cos C = \dfrac{a^2+b^2-c^2}{2ab}$

$a = b\cos C + c\cos B$	$b = a\cos C + c\cos A$	$c = a\cos B + b\cos A$
$\Delta = 0.5\ bc\sin A$	$\Delta = 0.5\ ac\sin B$	$\Delta = 0.5\ ab\sin C$

$\dfrac{d}{dx}(a^x) = a^x \ln a$	$\dfrac{d}{dx}(e^x) = e^x$
$\dfrac{d}{dx}(\log_a x) = \dfrac{1}{x(\ln a)}$	$\dfrac{d}{dx}(\ln x) = \dfrac{1}{x}$

$\dfrac{d}{dx}(\sin x) = \cos x$	$\dfrac{d}{dx}(\cos x) = -\sin x$
$\dfrac{d}{dx}(\tan x) = \sec^2 x$	$\dfrac{d}{dx}(\cot x) = -\operatorname{cosec}^2 x$
$\dfrac{d}{dx}(\sec x) = \tan x \sec x$	$\dfrac{d}{dx}(\operatorname{cosec} x) = -\operatorname{cosec} x \cot x$
$\dfrac{d}{dx}(\sinh x) = \cosh x$	$\dfrac{d}{dx}(\cosh x) = \sinh x$
$\dfrac{d}{dx}(\tanh x) = \operatorname{sech}^2 x$	$\dfrac{d}{dx}(\coth x) = -\operatorname{cosech}^2 x$
$\dfrac{d}{dx}(\operatorname{sech} x) = -\tanh x \operatorname{sech} x$	$\dfrac{d}{dx}(\operatorname{cosech} x) = -\operatorname{cosech} x \coth x$

$\dfrac{d}{dx}\sin^{-1}(x) = -\dfrac{d}{dx}\cos^{-1}(x) = \dfrac{1}{\sqrt{1-x^2}}$	$\dfrac{d}{dx}\sec^{-1}(x) = -\dfrac{d}{dx}\operatorname{cosec}^{-1}(x) = \dfrac{1}{\lvert x\rvert\sqrt{x^2-1}}$
$\dfrac{d}{dx}\tan^{-1} x = -\dfrac{d}{dx}\cot^{-1} x = \dfrac{1}{x^2+1}$	

$\dfrac{d}{dx}\sinh^{-1}(x) = \dfrac{1}{\sqrt{1+x^2}}$	$\dfrac{d}{dx}\cosh^{-1}(x) = \dfrac{\pm 1}{\sqrt{x^2-1}}$
$\dfrac{d}{dx}\tanh^{-1} x = \dfrac{\pm 1}{1-x^2}$	$\dfrac{d}{dx}\coth^{-1}(x) = \dfrac{1}{1-x^2}$
$\dfrac{d}{dx}\operatorname{sech}^{-1}(x) = -\dfrac{\pm 1}{\lvert x\rvert\sqrt{1-x^2}}$	$\dfrac{d}{dx}\operatorname{cosec}^{-1}(x) = -\dfrac{1}{\lvert x\rvert\sqrt{1+x^2}}$

$\displaystyle\int x^n\,dx = \frac{x^{n+1}}{n+1}$	$n \in R - \{-1\}$
$\displaystyle\int \frac{1}{x}\,dx = \ln\lvert x\rvert$	$x \in R - \{0\}$
$\displaystyle\int \cos x\,dx = \sin x$	$\forall x \in R$
$\displaystyle\int \sin x\,dx = -\cos x$	$\forall x \in R$
$\displaystyle\int \sec^2 x\,dx = \tan x$	$x \neq (2K-1)\dfrac{\pi}{2}$
$\displaystyle\int \operatorname{cosec}^2 x\,dx = -\cot x$	$x \neq K\pi$
$\displaystyle\int \sec x \tan x\,dx = \sec x$	$x \neq (2K-1)\dfrac{\pi}{2}$
$\displaystyle\int \operatorname{cosec} x \cot x\,dx = -\operatorname{cosec} x$	$x \neq K\pi$

$\int e^x\,dx = e^x$	
$\int a^x\,dx = \frac{a^x}{\ln a}$	$a \in R^+ - \{1\}$
$\int \frac{1}{K^2+x^2}\,dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right)$	$a \in R - \{0\}$
$\int \frac{1}{x^2+a^2}\,dx = \frac{-1}{a}\cot^{-1}\left(\frac{x}{a}\right)$	$a \in R - \{0\}$
$\int \frac{1}{x^2-a^2}\,dx = \frac{1}{2a}ln\left(\frac{x-a}{x+a}\right)$	$a \in R - \{0\}\ \&\ except\ (-a, a)$
$\int \frac{1}{a^2-x^2}\,dx = \frac{1}{2a}ln\left(\frac{x+a}{x-a}\right)$	$a \in R - \{0\}\ \&\ except\ (-a, a)$
$\int \frac{1}{\sqrt{a^2-x^2}}\,dx = \sin^{-1}\left(\frac{x}{a}\right) = -\cos^{-1}\left(\frac{x}{a}\right)$	$x \in (-a, a), a > 0$
$\int \frac{1}{\|x\|\sqrt{x^2-a^2}}\,dx = \frac{1}{a}\sec^{-1}\left(\frac{x}{a}\right) = -\frac{1}{a}\mathrm{cosec}^{-1}\left(\frac{x}{a}\right)$	$\|x\| > \|a\| > 0$
$\int \frac{1}{\sqrt{x^2 \pm a^2}}\,dx = \ln\left\|x + \sqrt{x^2 \pm a^2}\right\|$	$\forall x \in R$
$\int \tan x\,dx = \ln\|\sec x\|$	
$\int \cot x\,dx = \ln\|\sin x\|$	
$\int \mathrm{cosec}\,x\,dx = \ln\|\mathrm{cosec}\,x - \cot x\| = \ln\left\|\tan\frac{x}{2}\right\|$	
$\int \sec x\,dx = \ln\|\sec x + \tan x\| = \ln\left\|\tan\left(\frac{\pi}{2}+\frac{x}{2}\right)\right\|$	

$\int e^x[f(x) + f'(x)]\,dx = e^x f(x)$	$\int f(ax+b)\,dx = \frac{1}{a}F(ax+b)$
$\int [f(x)]^n f'(x)\,dx = \frac{[f(x)]^{n+1}}{n+1}$	$\int \frac{f'(x)}{f(x)}\,dx = \ln\|f(x)\|$

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

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

$\int uv\ \ dx = uv_1 - u'v_2 + u''v_3 - u'''v_4 + \cdots$	$d(uv) = udv + vdu$	$d\left(\frac{u}{v}\right) = \frac{v\,du - u\,dv}{v^2}$

INTEGRAL			LETS
$\sqrt{x^2+a^2}$			$x = a\ \tan\theta\ \ or\ x = a\ \cot\theta$
$\sqrt{x^2-a^2}$			$x = a\ \sec\theta\ \ or\ x = a\ \mathrm{cosec}\,\theta$
$\sqrt{a^2-x^2}$			$x = a\ \sin\theta\ \ or\ x = a\ \cos\theta$
$\sqrt{\frac{a-x}{a+x}}$			$x = a\ \cos 2\theta$
$\sqrt{2ax - x^2} = \sqrt{a^2 - (x-a)^2}$			$x = 2a\ \sin^2\theta\ \ or$ $x - a = a\sin\theta\ \ or\ x - a = a\cos\theta$
$\frac{1}{a + b\sin x}$	$\frac{1}{a + b\cos x}$	$\frac{1}{a + b\sin x + c\cos x}$	$t = \tan\frac{x}{2}$