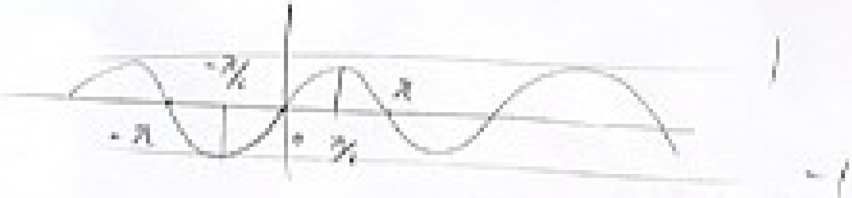
$\sin(\alpha+\beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$

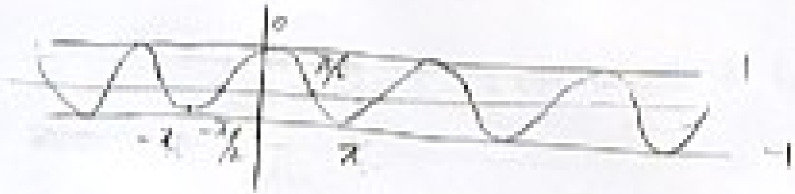
$\cos(\alpha+\beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$

$$\tan(\alpha+\beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta}$$

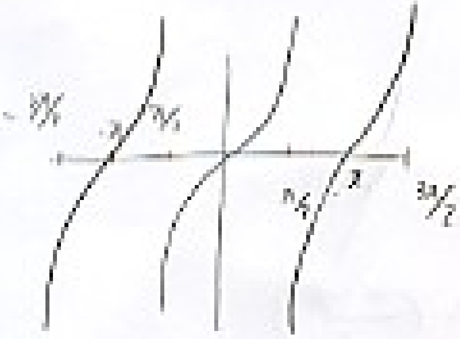
$y = \sin x$



$y = \cos x$



$y = \tan x$



$\sin 2\alpha = 2\sin\alpha\cos\alpha$

$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha = 2\cos^2\alpha - 1 = 1 - 2\sin^2\alpha$

$0 \le \alpha \le \pi/2$ $\quad \cos\frac{\alpha}{2} = \sqrt{\frac{1+\cos\alpha}{2}}$ $\quad \sin\frac{\alpha}{2} = \sqrt{\frac{1-\cos\alpha}{2}}$

$t = \tan\frac{\alpha}{2}$

$$\cos\alpha = \frac{1-t^2}{1+t^2}$$

$$\sin\alpha = \frac{2t}{1+t^2} \qquad \tan\alpha = \frac{2t}{1-t^2}$$

$$\sin(3\alpha) = \sin(\alpha + 2\alpha)$$

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

$$\cos 3\alpha = \cos(\alpha + 2\alpha)$$

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

$$\sin\alpha \pm \sin\beta$$

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

$$= (\sin\gamma\cos\delta + \cos\gamma\sin\delta) \pm (\sin\gamma\cos\delta - \cos\gamma\sin\delta)$$

$$\Rightarrow 2\sin\gamma\cos\delta = 2\sin\frac{\alpha+\beta}{2}\cos\frac{\alpha-\beta}{2}$$

$$2\cos\gamma\sin\delta = 2\cos\frac{\alpha+\beta}{2}\sin\frac{\alpha-\beta}{2}$$

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

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

$$2\sin\alpha\cos\beta = \sin(\alpha+\beta) + \sin(\alpha-\beta)$$

$$2\cos\alpha\sin\beta = \sin(\alpha+\beta) - \sin(\alpha-\beta)$$

$f'(x)$

$$\sin' x = \frac{d\sin x}{x} = \lim_{h\to 0}\frac{\sin(x+h) - \sin x}{h}$$

$\sin h$ when $h \to 0$ of $\sin h = h$

$\sin d\theta = \frac{r\,d\theta}{r} = d\theta$

$$\cos d\theta = \sqrt{1-\sin^2 d\theta} \quad d\theta \to 0$$

$$= \sqrt{1-d\theta^2}$$

$$= 1$$

$$\left((1+x)^n = 1 + nx + \frac{n(n-1)}{2}x^2 + \cdots \right)$$

$$\sqrt{1-x^2} = (1-x^2)^{1/2} = 1 + \frac{1}{2}(-x^2) + \cdots \text{ when } x \to 0$$

$$\fallingdotseq 1$$

$$(\sin x)' = \frac{h\cos x + \sin x - \sin x}{h} = \cos x$$

$$(\cos x)' = \frac{\cos x - h\sin x - \cos x}{h} = -\sin x$$

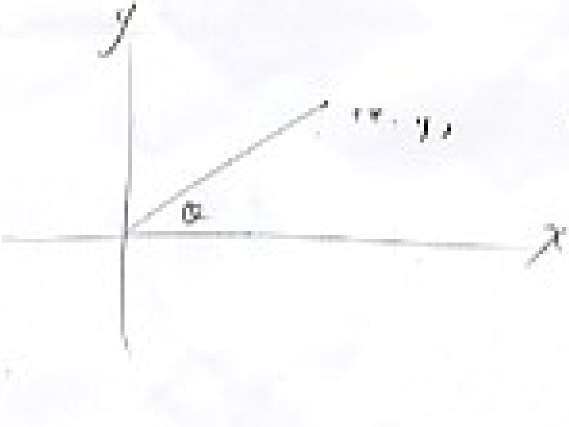
Complex number 複数

$x^2 + 1 = 0.$

$x^2 = -1 \qquad x = \sqrt{-1} \notin R$

$\equiv i$

$i^2 = -1$



$z = x + iy \qquad x, y \in R$

$|z| = \sqrt{x^2+y^2} = r$

$x = r\cos\theta \qquad y = r\sin\theta$

$z = r\cos\theta + i r\sin\theta = re^{i\theta}$

$x = Re\{z\}$ $\quad \bar{z} = z^* = x - iy$

$y = Im\{z\}$

$(a+bi)(c+di)$

$= (ac-bd) + i(ad+bc)$

$\Rightarrow z\bar{z} = \bar{z}z = x^2+y^2$

$|z|$ complex abs = $\sqrt{z\bar{z}} = \sqrt{x^2+y^2}$

ex $\quad \frac{1+i}{1-i} = \frac{(1+i)(1+i)}{(1-i)(1+i)} = \frac{1}{2} + \frac{3}{2}i$

$e^{i\alpha} = \cos\alpha + i\sin\alpha$ Euler formula.

$(e^{i\alpha})^n = (\cos\alpha + i\sin\alpha)^n$

$e^{in\alpha} = \cos n\alpha + i\sin n\alpha$