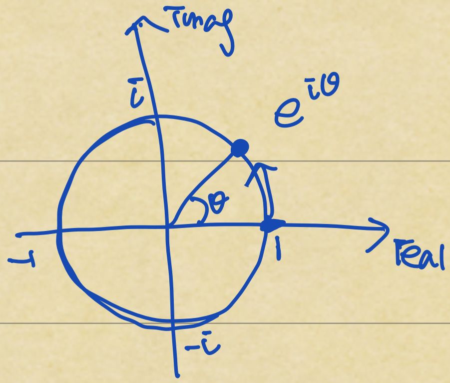
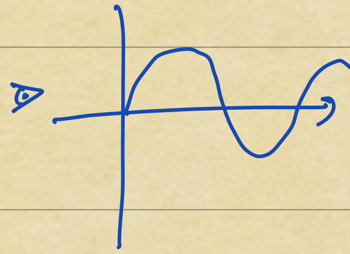
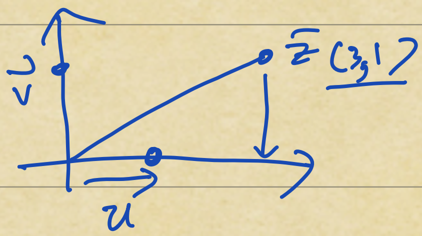


$$\boxed{e^{i\theta} = \cos\theta + i\sin\theta}$$



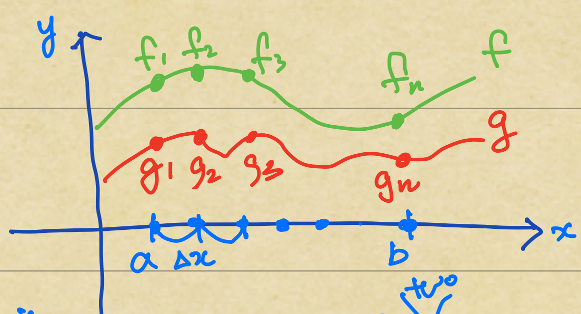


$$\vec{z} = \underbrace{\boxed{\langle \vec{z} \cdot \vec{u} \rangle}}_{3} \vec{u} + \underbrace{\langle \vec{z} \cdot \vec{v} \rangle}_{1} \vec{v}$$

$$\vec{V} = [V_1\ V_2\ V_3 \cdots] \quad \vec{W} = [W_1\ W_2\ W_3 \ldots]$$

$$\langle\langle \vec{V} \cdot \vec{W} \rangle\rangle = [V_1\ V_2\ V_3 \cdots] \begin{bmatrix} W_1 \\ W_2 \\ \vdots \end{bmatrix}$$

$$= V_1 W_1 + V_2 W_2 + \cdots$$



※ inner product of two functions f·g

$f = [f_1\ f_2\ \cdots\ f_n]$

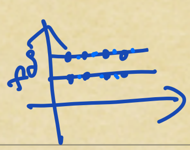
$g = [g_1\ g_2\ \cdots\ g_n]$

$$\left(\Delta x = \frac{b-a}{n-1}\right)$$

$$\langle\langle f \cdot g \rangle\rangle = (f_1 g_1 + f_2 g_2 + \cdots\ f_n g_n)\Delta x$$

$f(x) = 1$

$g(x) = 2$



$n=4$

$n=8$

$$\langle\langle f \cdot g \rangle\rangle = \underbrace{1\times 2 + 1\times 2}_{4} = 8$$

$$= \underbrace{1\times 2 + 1\times 2}_{8} = 16$$

$$\langle\langle f(x) \cdot g(x) \rangle\rangle = \int_a^b f(x) \cdot \overline{g(x)} \, dx$$

represents how "similar" $f(x) \cdot g(x)$ / $f(x) \cdot g(x)$ involve complex #

$$c = a + ib$$

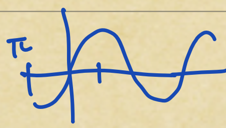
$$\bar{c} = a - ib \qquad \text{(conjugate)}$$

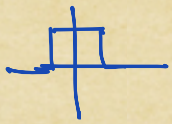
※ Fourier series

suppose $f(x)$ be a periodic function $T = 2\pi$ $[-\pi, \pi]$

Fourier series shows that

f is an infinite sum of sin/cos waves





$$f(x) = \sum_{k=-\infty}^{\infty} \langle\langle f(x) \cdot e^{ikx} \rangle\rangle e^{ikx}$$

$$= \frac{A_0}{2} + \sum_{n=1}^{\infty} \left(A_n \cdot \cos(nx) + B_n \cdot \sin(nx) \right)$$

$$A_n = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cdot \cos(nx) \, dx \qquad B_n = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cdot \sin(nx)$$

$n = 0$ $\boxed{A_0 = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \, dx}$ $B_0 = 0$