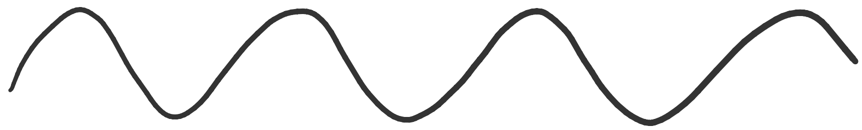
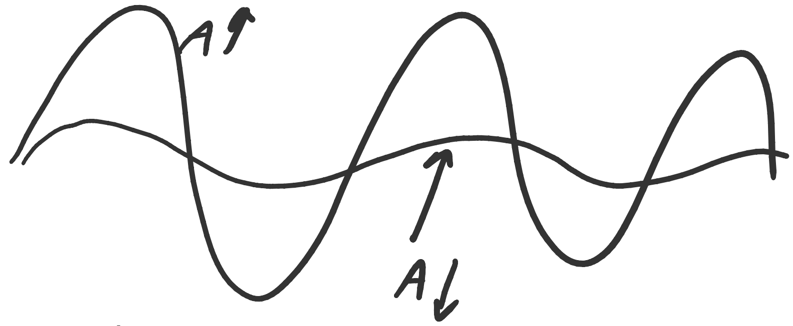
Sep 18, 2020

Friday, September 18, 2020 2:16 PM



$A \cos(\omega t - \varphi)$



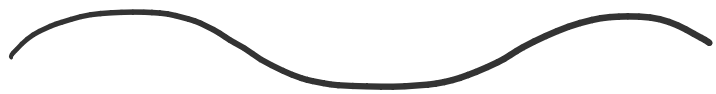
A : amplitude

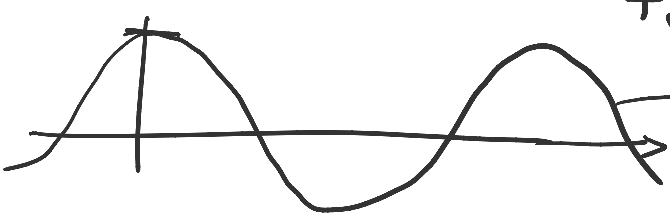
$\omega = 2\pi f$

f : frequency (Hz) f↑

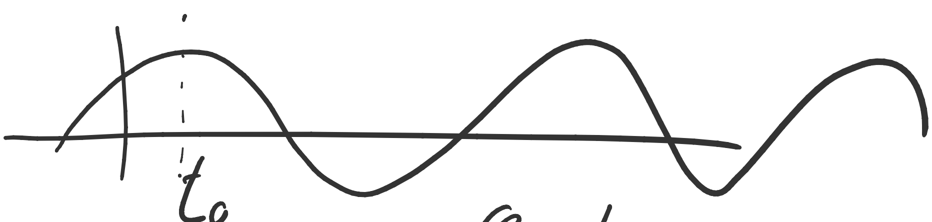
φ : phase

f↓



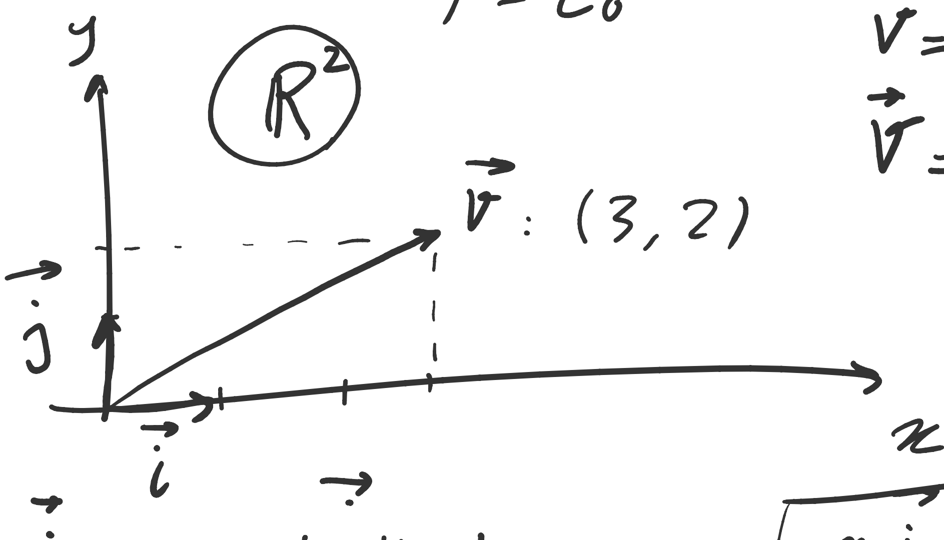


$\varphi = 0$



$\varphi = t_0$

$\mathbb{R}^2$



$\vec{v} = 3\vec{i} + 2\vec{j}$

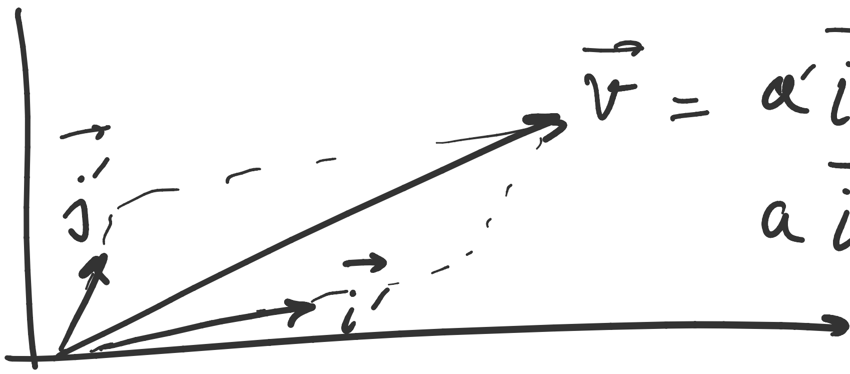
$\vec{v} = (\vec{v}\cdot\vec{i})\vec{i} + (\vec{v}\cdot\vec{j})\vec{j}$

$\{\vec{i}, \vec{j}\}$ Basis

$\boxed{a\vec{i} + b\vec{j}}$

$\|\vec{i}\| = 1 \quad \|\vec{j}\| = 1$

$\vec{i} \cdot \vec{j} = 0$



$\vec{v} = a'\vec{i}' + b'\vec{j}'$

$a\vec{i} + b\vec{j}$

$(a, b)\ \{i, j\}$

$(a', b')\ \{i', j'\}$

$\vec{v}_1 + \vec{v}_2 = \vec{v}_3$

$a\vec{v} = \vec{u}$

$u + (v + w) = (u + v) + w$

$\boxed{\text{Vector Space}}$

$u + v = v + u$

$\vec{u} \cdot \vec{v} = a$

Dot Product (inner product) $\langle \vec{u}, \vec{v} \rangle = a$

$\mathbb{R}^2$	$\mathbb{R}^3$	$\mathbb{R}^n$	$\vec{v}\ (x_1, x_2\ x_3,\ x_4)$
i, j	3	n	$(1, 0, 0, 0)$

$(0, 1, 0\ 0)$

$\vdots$

$\vec{v} = a\vec{i} + b\vec{j}$

$\vec{u} \cdot \vec{v}$

$f(t) = \sum_{k=..}^{..} a_k (\quad)$

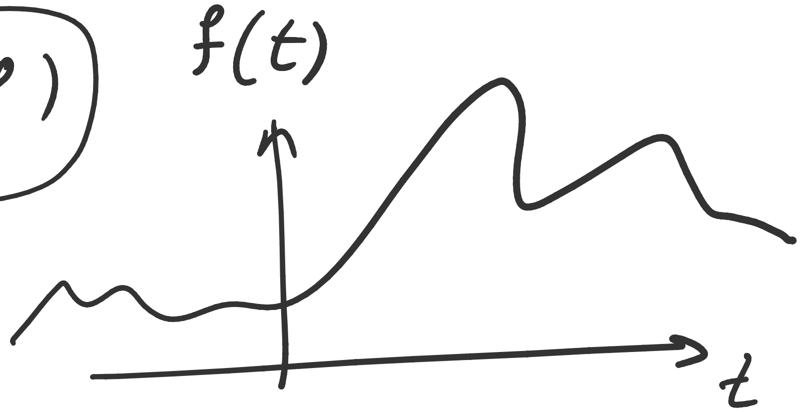
$\langle u, \vec{v} \rangle$

$$\sum_{k=..} \ldots \langle u, v \rangle$$

$$\langle \underline{f(t)}, \underline{g(t)} \rangle = \int_a^b f(t)\, g(t)\, dt$$

$$[a, b]$$

$$\underline{A} \cos(2\pi \underline{f}\, t - \underline{\varphi})$$



$f(t)$: a peridic function
period of T

$$f(t) = \frac{a_0}{2} + \sum_{k=1}^{\infty} a_k \underline{\cos}\left(\frac{2\pi k t}{T}\right) + \sum_{k=1}^{\infty} b_k \underline{\sin}\left(\frac{2\pi k t}{T}\right)$$

$\mathbb{R}^2$ $\quad \vec{v} = \underline{a}\, \vec{i} + \underline{b}\, \vec{j}$

$$v = (\vec{v} \cdot \vec{i})\, \vec{i} + (\vec{v} \cdot \vec{j})\, \vec{j}$$

$$V = (\vec{v}\cdot\vec{i})\,\vec{i} + (\vec{v}\cdot\vec{j})\,\vec{j}$$

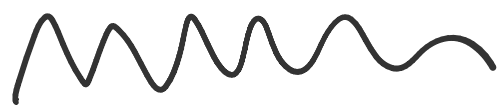
$$a = \vec{v}\cdot\vec{i} \qquad b = v\cdot j$$

$$a_k = \frac{2}{T}\int_0^T f(t)\cos\left(\frac{2\pi k t}{T}\right)dt$$

$$b_k = \frac{2}{T}\int_0^T f(t)\sin\left(\frac{2\pi k t}{T}\right)dt$$

$$\underline{f(t)} = \frac{a_0}{2} + \sum_{k=1}^{\infty} A_k \cos\left(\frac{2\pi k t}{T} - \varphi_k\right)$$

e^{int} $\quad\cos + i\sin$

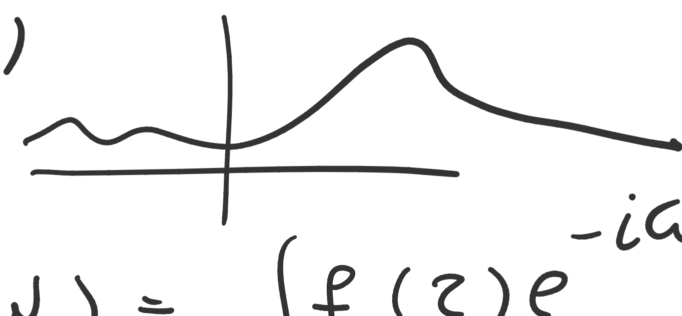


periodic function $\quad \sum$

↓ $\quad$ ↓

any function $\quad \int$

$f(t)$



$$F(\omega) = \int f(\tau)\, e^{-i\omega\tau}\, d\tau$$

$$F(\omega) = \int f(\tau) e \quad d\tau$$

$f(t)$ fft

Joseph Fourier

Carl Friedrich Gauss

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

$f(x) = \left(\frac{1}{\sigma\sqrt{2\pi}}\right) e \qquad 2\sigma^2$

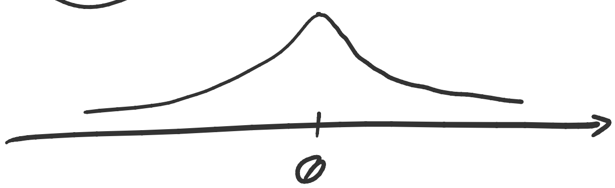
$G(x, \mu, \sigma)$ $\quad \mu$: mean

σ : SD

σ^2 : variance

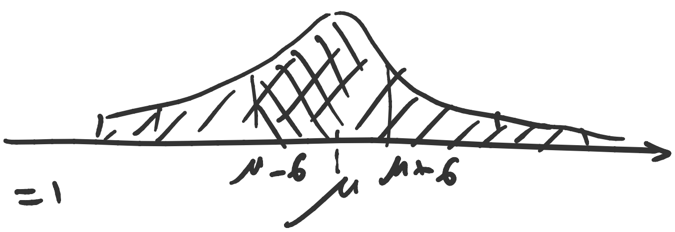
$\mu = 0$

$\sigma = 1$ $\quad \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$ $\quad x = 0$



$(x-\mu)^2$

$$\int_{-\infty}^{\infty} f(x)\, dx = 1$$



$\mu-\sigma, \mu+\sigma$

$\pm\sigma$ $\quad$ 68.2% $\quad$ 0.68

$\pm 2\sigma$ $\quad$ 95.5%

$\pm 3\sigma$ $\quad$ 99.7%

$$\int_{-\infty}^{+\infty} e^{-x^2}\, dx = \sqrt{\pi} \qquad y^2 = \frac{(x-\mu)^2}{2\sigma^2}$$

$dy = \dots$

$$\int_{-\infty}^{+\infty} e^{-\frac{(x-\mu)^2}{2\sigma^2}} = \underline{\sigma\sqrt{2\pi}}$$

$y = x - \underline{\mu} \longrightarrow dy = dx - 0$

$z^2 = \underline{y^2}$

$$z^2 = \frac{y^2}{2\sigma^2}$$

central limit theorm