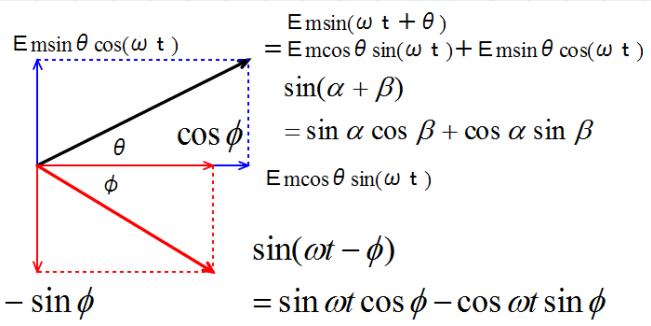
National Institute of Technology, Gifu College
Electrical and Computer Engineering
by T.Tokoro

Ex.F1 Fourier-Analysis (Sine wave)

$f := 50 \quad \omega := 2 \cdot \pi \cdot f \quad Em := 5$

$\theta := \frac{\pi}{6} \quad T := 2 \cdot \frac{\pi}{\omega}$



$E\,m\sin(\omega t + \theta)$
$= E\,m\cos\theta \sin(\omega t) + E\,m\sin\theta \cos(\omega t)$

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

$\sin(\omega t - \phi)$
$= \sin\omega t \cos\phi - \cos\omega t \sin\phi$

$e(t) := Em \cdot \sin(\omega \cdot t + \theta)$

$$a_0 := \frac{1}{T}\int_0^T e(t)\,dt = 5.274 \cdot 10^{-16}$$

$$a_1 := \frac{2}{T}\int_0^T e(t) \cdot \cos(\omega \cdot t)\,dt = 2.5 \qquad 5 \cdot \frac{1}{2} = 2.5$$

$$b_1 := \frac{2}{T}\int_0^T e(t) \cdot \sin(\omega \cdot t)\,dt = 4.33 \qquad 5 \cdot \frac{\sqrt{3}}{2} = 4.33$$

$$a_2 := \frac{2}{T}\int_0^T e(t) \cdot \cos(2 \cdot \omega \cdot t)\,dt = 5.829 \cdot 10^{-16}$$

$$b_2 := \frac{2}{T}\int_0^T e(t) \cdot \sin(2 \cdot \omega \cdot t)\,dt = 3.331 \cdot 10^{-16}$$

$$a_n(n) := \frac{2}{T}\int_0^T e(t) \cdot \cos(n \cdot \omega \cdot t)\,dt$$

$$b_n(n) := \frac{2}{T}\int_0^T e(t) \cdot \sin(n \cdot \omega \cdot t)\,dt$$

$a_n(1) = 2.5 \qquad a_n(2) = 5.829 \cdot 10^{-16} \qquad a_n(3) = 1.665 \cdot 10^{-16}$

$b_n(1) = 4.33 \qquad b_n(2) = 3.331 \cdot 10^{-16} \qquad b_n(3) = -9.714 \cdot 10^{-17}$

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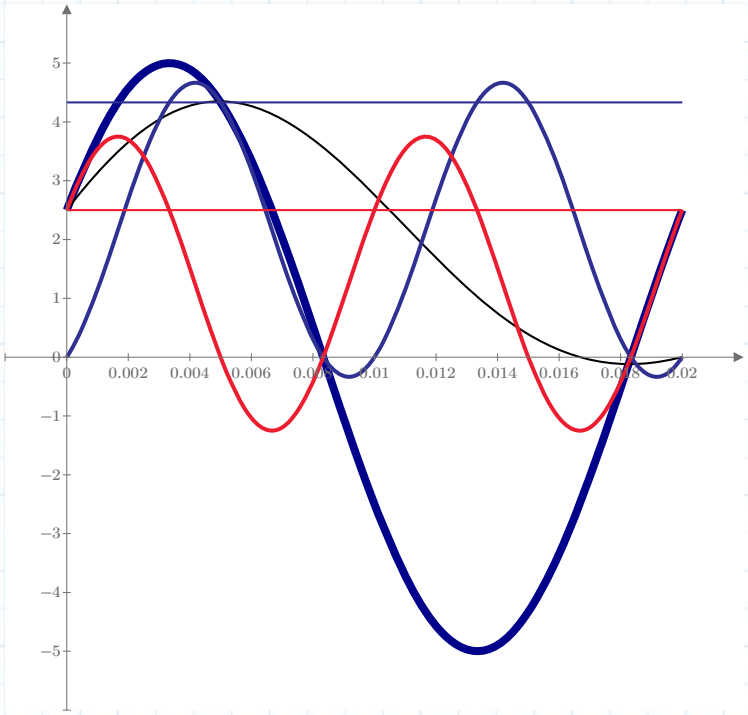
$t := 0, 0.0001 .. 0.02$

$a_0 := \frac{1}{T}\int_0^T e(t)\,dt = 5.274 \cdot 10^{-16}$ $\qquad \frac{1}{T}\int_0^T e(t)\,dt \to 0$



$e(t)$

$\frac{1}{t}\int_0^t e(t)\,dt$

$e(t) \cdot \sin(\omega \cdot t)$

$e(t) \cdot \cos(\omega \cdot t)$

$\frac{2}{T}\int_0^T e(t) \cdot \cos(\omega \cdot t)\,dt$

$\frac{2}{T}\int_0^T e(t) \cdot \sin(\omega \cdot t)\,dt$

t