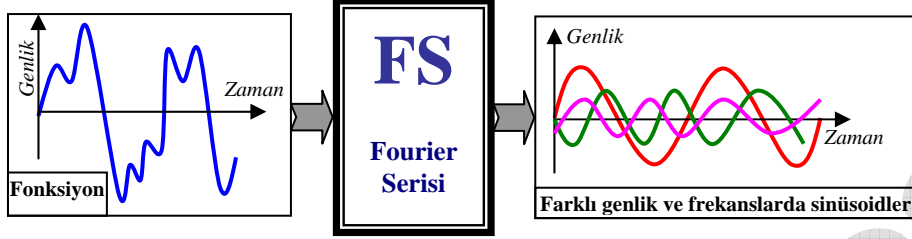


# FOURIER SERİSİ



Şekil 1 Fourier seri gösterimi

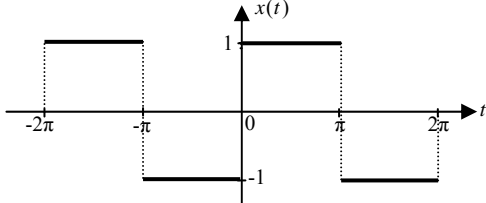
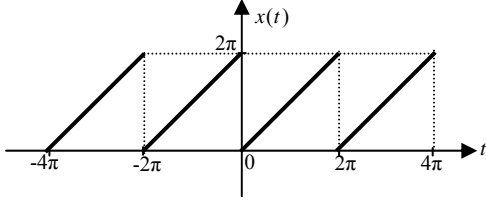
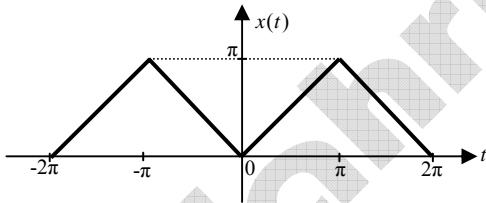
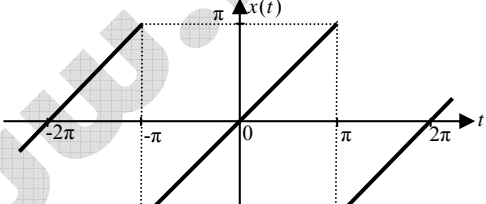
Tablo 1. Fourier serisi gösterim şekilleri

Gösterim şekli	Seri açılımı	Katsayıları
<b>Trigonometrik</b>	$x(t) = \frac{1}{2} a_0 + \sum_{k=1}^{\infty} \{a_k \cdot \text{Cos}(k\omega_0 t) + b_k \cdot \text{Sin}(k\omega_0 t)\}$	$a_0 = \frac{2}{T_0} \int_{T_0} x(t) dt$ $a_k = \frac{2}{T_0} \int_{T_0} x(t) \cdot \text{Cos}(k\omega_0 t) dt$ $b_k = \frac{2}{T_0} \int_{T_0} x(t) \cdot \text{Sin}(k\omega_0 t) dt$
<b>Karmaşık üstel</b>	$x(t) = \sum_{k=-\infty}^{\infty} c_k \cdot e^{jk\omega_0 t}$	$c_k = \frac{1}{T_0} \int_{T_0} x(t) \cdot e^{-jk\omega_0 t} dt$
<b>Harmonik</b>	$x(t) = R_0 + \sum_{k=1}^{\infty} R_k \cdot \text{Cos}(k\omega_0 t + \theta_k)$ <p>veya</p> $x(t) = R_0 + \sum_{k=1}^{\infty} R_k \cdot \text{Sin}(k\omega_0 t + \theta_k)$	$R_0$ : DA bileşen $R_k$ : Harmonik genliği $\theta_k$ : Faz açısı

Tablo 2. Fourier katsayıları arasındaki ilişkiler

Gösterim şekli	İlişki
<b>Trigonometrik</b> $\leftrightarrow$ <b>Karmaşık üstel</b>	$\begin{cases} \frac{a_0}{2} = c_0 & , & a_k = c_k + c_{-k} & , & b_k = j(c_k - c_{-k}) \\ a_k = 2 \text{Re}[c_k] & , & b_k = -2 \text{Im}[c_k] \end{cases}$
<b>Trigonometrik</b> $\leftrightarrow$ <b>Harmonik</b>	$C_0 = \frac{a_0}{2} \quad , \quad  C_k  = \sqrt{a_k^2 + b_k^2} \quad , \quad \theta_k = \text{Arctg}\left(-\frac{b_k}{a_k}\right)$

Tablo 3. Bazı periyodik fonksiyonların seri açılımları ve grafikleri

Periyodik fonksiyon	Seri açılımı
	$x(t) = \frac{4}{\pi} \left( \sin(t) + \frac{\sin(3t)}{3} + \frac{\sin(5t)}{5} + \dots \right)$
	$x(t) = \pi - 2 \left( \sin(x) + \frac{\sin(2x)}{2} + \frac{\sin(3x)}{3} + \dots \right)$
	$x(t) = \frac{\pi}{2} - \frac{4}{\pi} \left( \cos(t) + \frac{\cos(3t)}{3^2} + \frac{\cos(5t)}{5^2} + \dots \right)$
	$x(t) = 2 \left( \sin(x) - \frac{\sin(2x)}{2} + \frac{\sin(3x)}{3} - \dots \right)$