A signal $x(t)$ is said to be:

**Even** if $x(t) = x(-t)$

**Odd** if $x(t) = -x(-t)$

$x(t)$ is even if $x(c)$ is even.
Any signal \( x(t) \) can be written as the sum of an even signal and an odd signal.

\[
x(t) = \Re \{ x(t) \} + \Im \{ x(t) \}
\]

\[
\Re \{ x(t) \} = \frac{1}{2} \left[ x(t) + x(-t) \right]
\]

\[
\Im \{ x(t) \} = \frac{1}{2} \left[ x(t) - x(-t) \right]
\]
\[ \begin{align*}
\frac{z}{\phi} &= \frac{1}{2} \\
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\end{align*} \]

Example: Find the even and odd parts of

\[ \begin{align*}
\left[ (4 \cdot z - (4) \cdot x) + x \right] \frac{z}{\phi} &= \left[ (4 \cdot z - (4) \cdot x) \right] \frac{z}{\phi} \\
\left[ (4 \cdot z - (4) \cdot x) + x \right] \frac{z}{\phi} &= \left[ (4 \cdot z - (4) \cdot x) \right] \frac{z}{\phi}
\end{align*} \]
\[
\begin{align*}
\cos(t) & = \cos((-t)) = \cos(-t) \\
\sin(t) & = \sin((-t)) = -\sin(t)
\end{align*}
\]
Even x odd = odd

Odd x odd = Even

Even x Even = Even

\[ x_{e3}(t) = x_{e1}(-t) + x_{e2}(t) \]
\[ x_{e3}(t) = x_{e1}(t) + x_{e2}(-t) \]

Even signal + odd signal = we can say anything

Even signal + odd signal = odd signal

Even signal + Even signal = Even signal

Properties of Even and Odd Signals
\begin{align*}
\text{If } x(t) \text{ is even, then:} \\
\int_{-A}^{A} x(t) \, dt &= 2 \int_{0}^{A} x(t) \, dt \\
\int_{-A}^{A} \sin^2 \theta \, d\theta &= 0
\end{align*}
\[ x(t) \text{ is complex, conjugate symmetric} \quad \iff \quad x(t) \text{ is real} \]
\[ x(t) \text{ is real and even} \quad \iff \quad x(0) = 0 \]
\[ x(t) \text{ is conjugate symmetric} \quad \iff \quad x(t) \text{ is real and even} \]
\[ \text{If } x(t) \text{ is real, then } x(t) \text{ is conjugate symmetric.} \]
\[ x(t) = -x^*(t) \quad \implies \quad \text{Conjugate symmetric of } x(t) = -x^*(t) = x(-t) \]
\[ \text{If } x(t) = x^*(-t) \implies \text{Even signal} \text{ - Conjugate symmetric signal} \]
\[ x(t) = x(-t) + \beta(t) = \Re\{x(t)e^{-j\theta(t)}\} \]
\[ \text{Suppose } x(t) \text{ is a complex signal} \]
\[ \text{Conjugate symmetric} \]
\[ a(t) = b(t) - \psi(t) \]

\[ b(t) = a(t) \]

\[ \forall t \in \mathbb{R}, \ x(t) = c(t) \]

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