

Odd and Even Signals

$$\text{even} \rightarrow x(t) = x(-t)$$

$$\text{odd} \rightarrow x(t) = -x(-t)$$

Break any signal into odd and even parts

$$x(t) = x_e(t) + x_o(t) \quad (1)$$

$$\text{whereby } x_e(t) = x_e(-t)$$

$$x_o(t) = -x_o(-t)$$

Formula for $x_e(t)$

$$\text{NOTE } x(-t) = x_e(-t) + x_o(-t) = x_e(t) - x_o(t) \quad (2)$$

Take sum and difference of (1) and (2)

Sum

$$x(t) = x_e(t) + x_o(t)$$

$$x(-t) = x_e(t) - x_o(t)$$

$$\underline{x(t) + x(-t)} = \underline{2x_e(t)}$$

$$\underline{x(t) + x(-t)} = \underline{2x_e(t)} \quad (3)$$

Difference

$$x(t) = x_e(t) + x_o(t)$$

$$x(-t) = x_e(t) - x_o(t)$$

$$x(t) - x(-t) = x_o(t) - (-x_o(t))$$

$$x(t) - x(-t) = x_o(t) + x_o(t)$$

$$x(t) - x(-t) = 2x_o(t)$$

$$\underline{x(t) - x(-t)} = \underline{2x_o(t)} \quad (4)$$