Operations on continuous-time and discrete-time signals (including transformations of independent variables)

Contd…

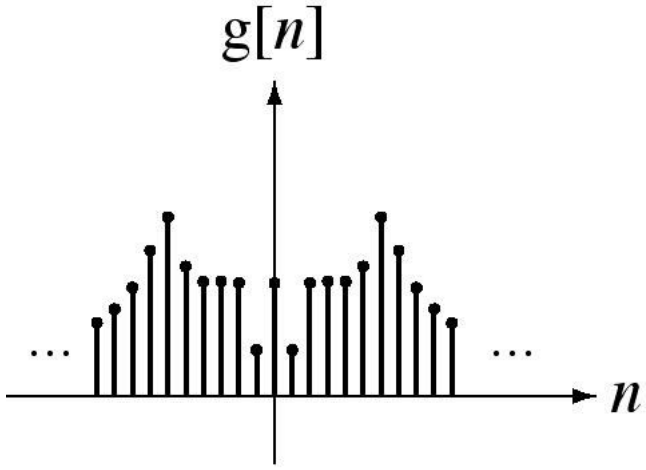
Derivatives and Integrals of Functions

Function type	Derivative	Integral
Even	Odd	Odd + constant
Odd	Even	Even

Discrete Time Even and Odd Signals

$$g[n] = g[-n]$$

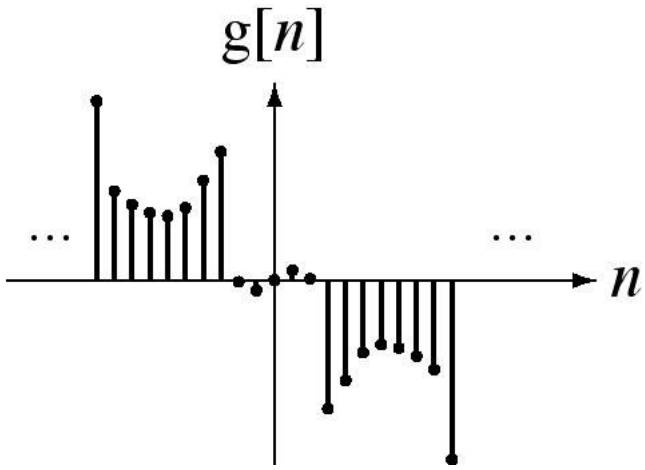
Even Function



$$g_e[n] = \frac{g[n] + g[-n]}{2}$$

$$g[n] = -g[-n]$$

Odd Function



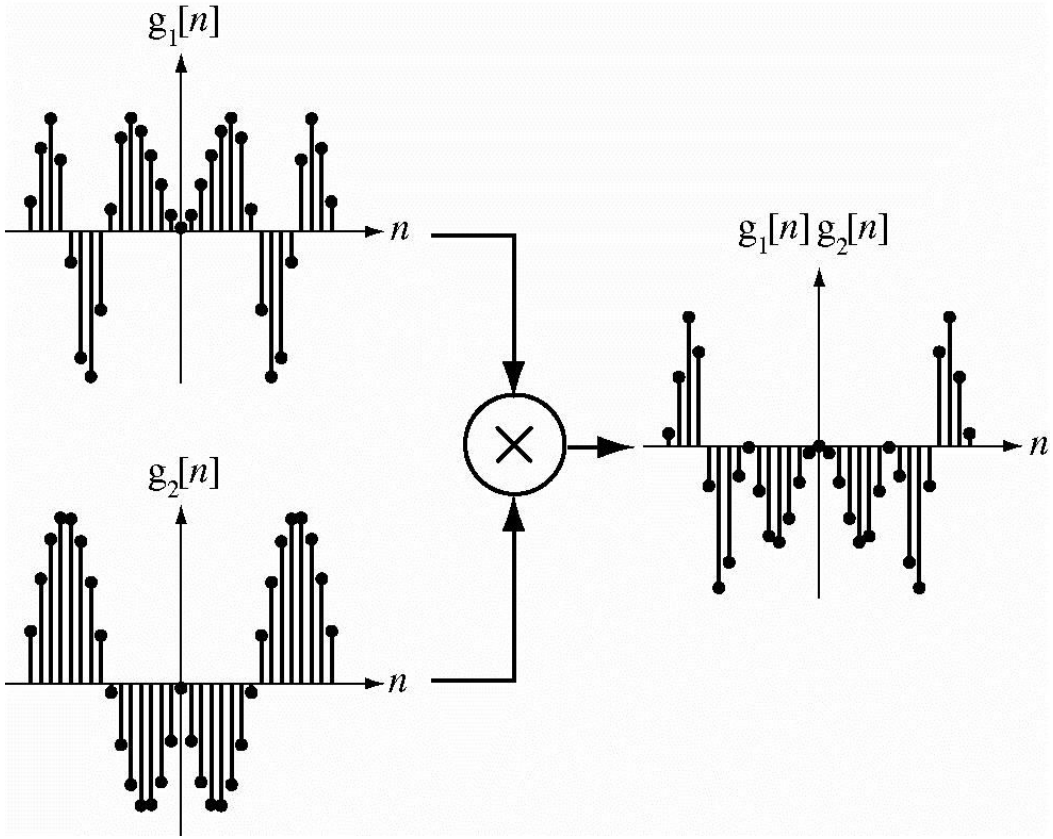
$$g_o[n] = \frac{g[n] - g[-n]}{2}$$

Combination of even and odd function for DT Signals

Function type	Sum	Difference	Product	Quotient
Both even	Even	Even	Even	Even
Both odd	Odd	Odd	Even	Even
Even and odd	Even or Odd	Even or odd	Odd	Odd

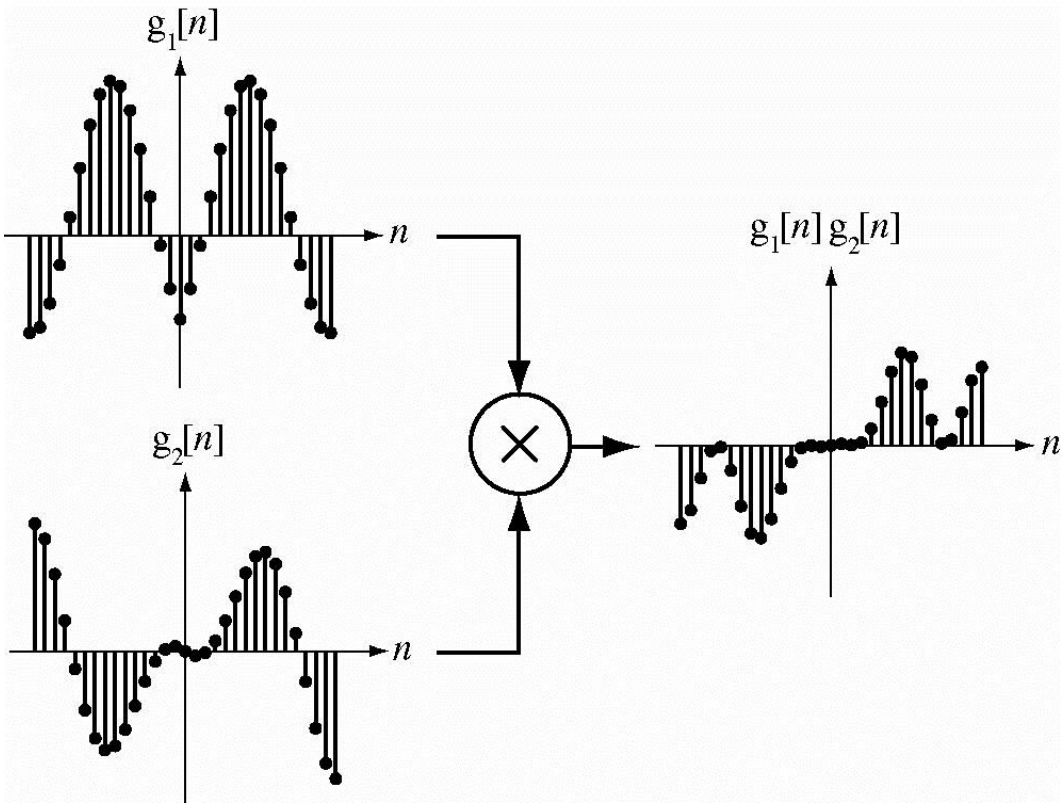
Products of DT Even and Odd Functions

Two Even Functions



Products of DT Even and Odd Functions Contd.

An Even Function and an Odd Function



Proof Examples

- Prove that product of two even signals is even.

Change t→ -t

$$x(t) = x_1(t) \times x_2(t) \rightarrow$$

$$x(-t) = x_1(-t) \times x_2(-t) =$$

$$x_1(t) \times x_2(t) = x(t)$$

- Prove that product of two odd signals is odd.

- What is the product of an even signal and an odd signal? Prove it!

$$x(t) = x_1(t) \times x_2(t) \rightarrow$$

$$x(-t) = x_1(-t) \times x_2(-t) =$$

$$x_1(t) \times -x_2(t) = -x(t) =$$

$$x(-t) \leftarrow Even$$

Products of DT Even and Odd Functions Contd.

Two Odd Functions