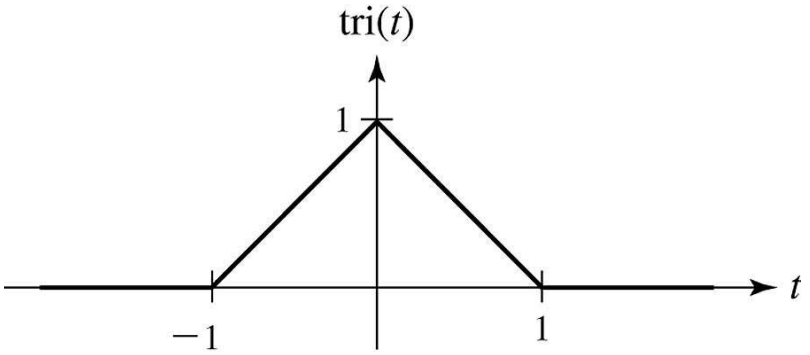
ENSC380
Lecture 3

Objectives:

- More signal transformations: Differentiation, Integration
- Learning about even and odd functions, and how to extract the even and odd parts of a function
- Derivative and integral of even and odd functions
- Periodic signals

Differentiation / Integration

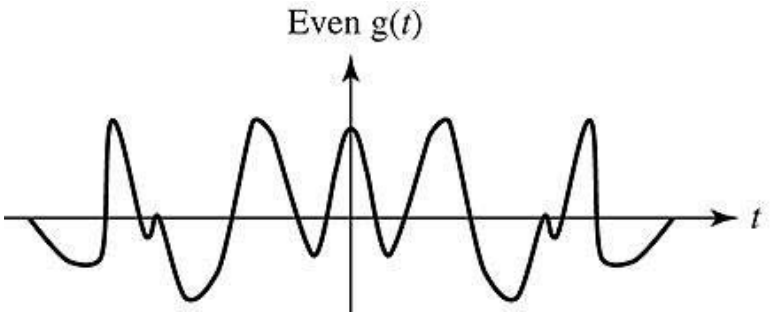
- Differentiation and Integration can be considered as two more forms of signal transformation.
- By differentiating a signal we find the rate of the changes in the signal.
- By integrating a signal we find the area under the signal
- Example: Find the derivative of this functions:

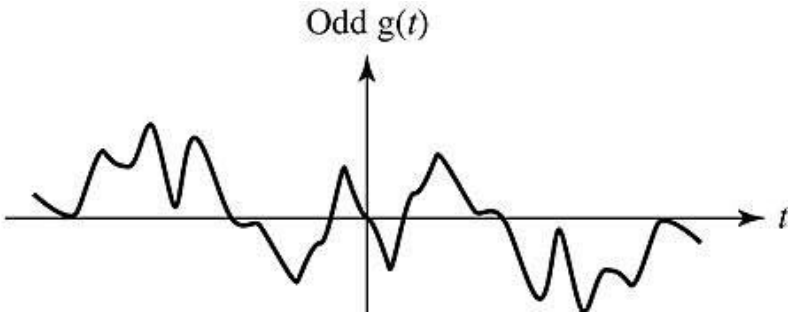


- Example: Find the integral of u(t)

Even/Odd Functions

- Even function: $g(-t) =$
- Odd function: $g(-t) =$





- Every function can be written as the sum of an even and an odd function, i.e., $g(t) = g_e(t) + g_o(t)$, where

$g_e(t) =$ $g_o(t) =$

Sum and Product

- Sum of two even functions is
- Sum of two odd functions is
- Sum of an even and an odd function is
- Product of two even functions is
- Product of two odd functions is
- Product of an even and an odd function is

Differential and Integral

- The derivative of an even function is
- The derivative of an odd function is
- The integral of an even function is
- The integral of an odd function is

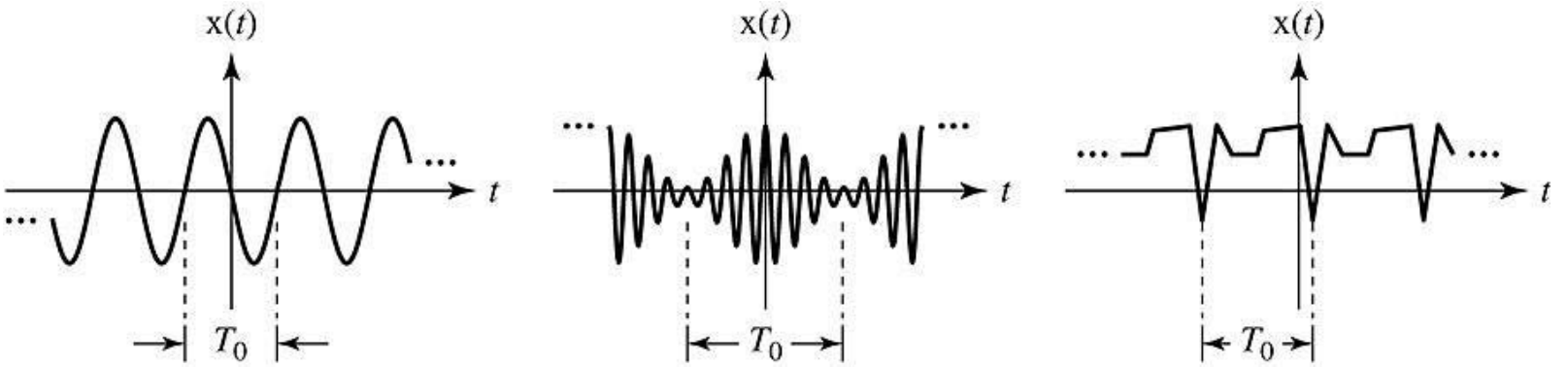
Periodic Signals

- If g(t) is periodic with period T, then

$$g(t) =$$

- If T is the smallest number for which the above equation holds, then T is called the **fundamental period** of $g(t)$

- The **fundamental frequency** of $g(t)$ is defined as



Sum of Periodic Signals

If the periods of two periodic signals have a **finite** least common multiple, then the sum of the two signals is periodic: