ET 644 – Advanced Digital Signal Processing

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Chapter 2 of P & M Text

Discrete-time Signals - Special Cases

• Kronecker Delta Function:

$$\delta[n] = \begin{cases} 1, & n = 0 \\ 0, & n \neq 0 \end{cases}$$

– graphical presentation of the Delta Function

• Unit Step Function:

$$u[n] = \begin{cases} 1, & n \geq 0 \\ 0, & n < 0 \end{cases}$$

– graphical presentation of the Delta Function

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- Geometric Sequences

$$x[n] = a^n u[n],$$

where a is a complex-valued scalar

Observe:

$$x_a(t) = e^{-bt} u(t)$$

Sampling:

$$x[n] = x_a(nT_s), \text{ for } -\infty < n < +\infty$$

$x[n] = e^{-bnT_s} u(nT_s) = a^n u[n]$
  where $a = e^{-bT_s}$ – See Fig. 1.20 in text.
- Consider: $a = e^{j\omega_0}$
  Obtain DT sinusoid: $\qquad x[n] = e^{j\omega_0 n} u[n]$

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- also

$$x[n] = cos(\omega_0 n)$$

- Real-valued DT sinewave
- See Fig. 1.13 of P & M Text.