Department of Electrical Engineering
School of Science and Engineering

EE310 Signals and Systems

TUTORIAL 1

Tutorial 1-1

Express the following complex numbers in Cartesian form $(x + jy)$

(a) $\sqrt{2}e^{j5\pi/2}$

(b) $\frac{1}{2}e^{-j9\pi/4}$

Tutorial 1-2

Express the following complex numbers in polar form $(re^{j\theta})$

(a) $\frac{1}{2} - j\frac{\sqrt{3}}{2}$

(b) $j(1-j)$

(c) j^j

(d) $\left(\frac{1}{\sqrt{2}} - j\frac{1}{\sqrt{2}}\right)^{1+2j}$

Tutorial 1-3

Determine P_∞ and E_∞ for the following signals

(a) $x[n] = \left(\frac{1}{3}\right)^n (u[n+3] - u[n-5])$

(b) $x[n] = \left(\frac{1}{2}\right)^n u[n]$

Tutorial 1-4

Determine if $x[n] = 3e^{j\pi(n+\frac{1}{2})/5}$ is period; if yes then calculate the fundamental period of $x[n]$.

Tutorial 1-5

Determine whether each of the following systems described by input-output relationship, where $x(t)$ or $x[n]$ is the input signal and $y(t)$ or $y[n]$ is the output signal, are: i) linear, ii) time-invariant, and iii) causal and iv) stable.

System	Linear	Time-Invariant	Causal	Stable
$y(t) = x(t-1)$				
$y[n] = x[1-n]$				
$y(t) = 2x(t) + 3$				
$y(t) = x(5t)$				
$y[n] = \sum_{k=0}^{\infty} x[k]$				
$y[n] = \sum_{k=-10}^{n-3} x[k]$				

Tutorial 1-6

Determine whether each of the following signals is either energy or power signal.

(a) $x(t) = \cos(2\pi t)$

(b) $x(t) = \cos(2t - \pi/2)\big(u(t + \pi/2) - u(t - 2\pi)\big)$

(c) $x[n] = u[n + 2] - u[n - 5] + 2\delta[n - 3]$

Version: February 7, 2019