EOCP 1.3

Check the periodicity for each of the following signals for $0 \leq n \leq \infty$. If they are periodic, what is the period?

1. $\cos(2\pi n + \pi)$
2. $(.1)^n \cos(5\pi n + \frac{\pi}{2})$
3. $u(n)$
4. $u(n) + 1$
5. $\delta(n) + u(n)$
6. $\cos\left(\sqrt{2}\pi n\right)$
7. $u(n) + \cos(2\pi n + \pi)$
8. $\cos(2\pi n + \pi) + \delta(n - 1)$
9. $2\cos(2n - \pi)$
10. $\cos\left(\frac{3}{2} n + \pi\right) + u(n)$

EOCP 1.4

Use MATLAB to check periodicity for the signal in EOCP 1.3.

EOCP 1.5

Find the power in the following signals:

1. $u(n) \qquad n \geq 0$
2. $u(n) \qquad n \geq 1$
3. $\sum_{m=0}^{\infty} \delta(n - m) \quad n \geq 0$

EOCP 1.6

Find the energy in each of the following signals for $-5 \leq n \leq 5$:

1. $\delta(n)$
2. $\cos(2\pi n)$
3. $u(n) \cdot \delta(n)$
4. $2u(n)\cos(2\pi n)$
5. $u(n) \cdot u(-n)$
6. $n \cos(2\pi n)$

Find the energy in the following signals for $n > 0$:

1. $u(n)\,(.1)^n$
2. $(.1)^n \cos(2\pi n)$
3. $(.5)^n n$

EOCP 1.7

Consider the following signals.

1. $x(n) = u(n) + u(n-1)$ $\quad 0 \le n \le 5$
2. $x(n) = nu(n)$ $\quad 0 \le n \le 5$
3. $x(n) = (.1)^n \cos(2\pi n + 1)$ $\quad 0 \le n \le 5$

a) Use MATLAB to sketch the even and the odd parts.
b) Show that the energy in $x(n)$ is the sum of the energy in its components, the even and the odd parts.
c) Are the signals bounded?

EOCP 1.8

Usually the discrete signals we deal with in engineering, $x(n)$, are obtained by taking samples from continuous signals $x(t)$. Give five examples where discrete signals are naturally discrete.

EOCP 1.9

Consider the following signals

1. $x(t) = e^{-3t}u(t)$
2. $x(t) = e^{-t}\cos(1000t)u(t)$

a) Let us take samples from both signals every 2 sec. Find $x(n)$ for both.
b) What is the time constant for the first signal?
c) If $0 \le n \le 10$, find the energy in $x(n)$ for both signals.

EOCP 1.10

Let $y(n) = y(n-1) + u(n)$ with $y(-1) = 1$ for $n \ge 0$

1. Write down the samples for $y(n)$.
2. Can you find a closed form equation for $y(n)$?

EOCP 1.11

Let $y(-1) = 1$ and consider the equation

$$y(n) = 2y(n-1) + u(n)$$

1. Find the samples for $y(n)$ for $n \ge 0$.
2. Find a mathematical closed form expression for $y(n)$.