0.1 Mathematics for SmartIoT, 1st week

1. The sequence $x[k]$ is obtained by sampling $f(t) = \cos(t+2)$, $t \in R$. The sampling begins at $t = 0$ and thereafter at $t = 1, 2, 3, \ldots$. Write down the first six terms of the sequence.

2. A sequence, $x[k]$, is defined by

$$x[k] = \frac{k^2}{2} + k, \quad k = 0, 1, 2, 3, \ldots$$

   State the first five terms of the sequence.

3. Write down the first five terms, and plot the graphs, of the sequences given recursively by

$$(a) \quad x[k] = \frac{x[k-1]}{2}, \quad x[0] = 1,$$

$$(b) \quad x[k] = 3x[k-1] - 2x[k-2], \quad x[0] = 2, x[1] = 1.$$

4. Write down the 10th and 19th terms of the arithmetic progressions

   (a) 8,11,14,..

   (b) 8,5,2,...

5. Write down the 5th and 10th terms of the geometric progression 8,4,2,„...

6. A geometric progression is given by

$$a, ar, ar^2, ar^3, \ldots$$

   If $|(k+1)$th term$| > |k$th term$|$ and $(k+1)$th term $\times$ kth term < 0, which of the following, if any, must be true?

   (a) $r > 1$, (b) $a > 1$, (c) $r < -1$, (d) a is negative, (e) $-1 < r < 1$.

7. A geometric progression has first term $a = 1$. The ninth term exceeds the fifth term by 240. Find possible values for the eight term.