

PROBLEM:

A discrete-time signal $x[n]$ is known to be a sinusoid:

$$x[n] = A \cos(\hat{\omega}_0 n + \phi)$$

The values of $x[n]$ are tabulated for $n = 0, 1, 2, 3, 4, 5$ and 6 .

n	0	1	2	3	4	5	6
$x[n]$	-2.5000	-0.5226	1.5451	3.3457	4.5677	5.0000	4.5677

- (a) Plot $x[n]$ vs. n in the format of a MATLAB “stem” plot.
- (b) Prove (via phasors, not trig) the following identity for the cosine signal:

$$\beta = \frac{\cos(n+1)\hat{\omega}_0 + \cos(n-1)\hat{\omega}_0}{\cos n\hat{\omega}_0} \quad \text{for all } n$$

Determine the value of the constant β . Note: β does not depend on n , but it might be a function of $\hat{\omega}_0$.

- (c) Now determine the numerical values of A , ϕ and $\hat{\omega}_0$. (Hint: find $\hat{\omega}_0$ first.)