



## 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  $\beta$ . Note:  $\beta$  does not depend on  $n$ , but it might be a function of  $\hat{\omega}_0$ .

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