PROBLEM:

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

$$x[n] = A\cos(\omega_0 n + \phi)$$

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.

(b) Prove (via phasors, not trig) the following identity for the cosine signal:

$$\beta = \frac{\cos(n+1)\omega_0 + \cos(n-1)\omega_0}{\cos n\omega_0} \qquad \text{for all } n$$

Determine the value of the constant β. Note: β does not depend on n, but it might be a function of ω_0.

(c) Now determine the numerical values of A, ϕ and ω_0. (Hint: find ω_0 first.)