

1. Show that, if  $\omega$  is an  $n^{\text{th}}$  root of unity, then so is  $\omega^{-1}$ .
2. Show that, if  $\omega$  is an  $n^{\text{th}}$  root of unity, then so is  $\omega^k$  for any  $k \in \mathbb{N}$ .

An  $n^{\text{th}}$  root of unity is called *primitive* if it is not an  $m^{\text{th}}$  root of unity for any  $m \in \mathbb{Z}^+$  with  $1 \leq m < n$ .

3. Prove that, if  $\omega$  is a primitive  $n^{\text{th}}$  root of unity, then  $\omega^0, \omega^1, \dots, \omega^{n-1}$  are all distinct.
4. Show that, if  $\omega$  is a primitive  $5^{\text{th}}$  root of unity, then

$$\omega^4 + \omega^3 + \omega^2 + \omega + 1 = 0$$