1. Let $\theta_j = \frac{2\pi j}{4}$. Find the degree measure of $\theta_j$ for $j = 1, 2, 3, 4$.

2. Let $\omega_j = e^{\frac{2\pi j}{4}}$. Use the formula above to find $\omega_j$ for $j = 1, 2, 3, 4$.

3. Find $\omega_j^2$, $\omega_j^3$ and $\omega_j^4$ for $j = 1, 2, 3, 4$.

4. Explain why $\omega_j^{-1} = \omega_j^3$ for any choice of $j$.

5. Find $\omega_j + \omega_j^{-1}$ for $j = 1, 2, 3, 4$. (Hint: these are all real numbers).

6. Draw a cycle graph $C_4$ with vertices 1, 2, 3, 4 and corresponding adjacency matrix $A$.

7. For each $j = 1, 2, 3, 4$ show that $\hat{x}_j = \begin{pmatrix} \omega_j \\ \omega_j^2 \\ \omega_j^3 \\ 1 \end{pmatrix}$ is an eigenvector for $C_4$ with corresponding eigenvalue $\omega_j + \omega_j^{-1}$.