

Further Pure 1

Complex Numbers

Exercise G

6. (i) $w = 1 - j$

$$w^2 = (1 - j)^2 = 1 - 2j + j^2 = 1 - 2j - 1 = -2j$$

$$w^3 = w^2 w = -2j(1 - j) = -2j + 2j^2 = -2j - 2 = -2 - 2j$$

$$w^4 = (w^2)^2 = (-2j)^2 = 4j^2 = -4$$

(ii) $w^4 + 3w^3 + pw^2 + qw + 8 = 0$

$$-4 + 3(-2 - 2j) + p(-2j) + q(1 - j) + 8 = 0$$

$$-4 - 6 - 6j - 2pj + q - qj + 8 = 0$$

$$(-4 - 6 + q + 8) + (-6 - 2p - q)j = 0$$

$$(q - 2) + (-6 - 2p - q)j = 0$$

Equating real parts $\Rightarrow q - 2 = 0 \Rightarrow q = 2$

Equating imaginary parts $\Rightarrow -6 - 2p - q = 0$

$$\Rightarrow -6 - 2p - 2 = 0$$

$$\Rightarrow 2p = -8 \Rightarrow p = -4$$

(iii) Two roots are $1 - j$ and $1 + j$.