12. Form a cubic equation with real coefficients, two of whose roots are 2 and $-1 + i$.

multiply 3 factors to get cubic equation

OR

get quadric from im Roots multiply by Real linear factor ✓

$X^2 - (\text{Sum})X + \text{Product} = 0$

$R_1 + R_2 = (-1+i) + (-1-i) = -2$

$R_1 R_2 = (-1+i)(-1-i) = 1 \pm 1i^2 = 2$

$\Rightarrow X^2 + 2X + 2 = 0$

Linear factor $= (X-2)$

$(X-2)(X^2+2X+2) = 0$

$X^3 + 2X^2 + 2X - 2X^2 - 4X - 4 = 0$

$X^3 - 2X - 4 = 0$

Exercise 3.7

1. Express each of the following in the form $a + bi$.

(i) $4\left(\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}\right)$

(ii) $2\left(\cos\frac{5\pi}{6} + i\sin\frac{5\pi}{6}\right)$

(iii) $\sqrt{2}\left(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4}\right)$

(iv) $2\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$

CONVERT

calculator

RADS $\rightarrow$ DEGS

$\frac{3\pi}{4} = \frac{3(180^\circ)}{4} = 135^\circ$

$\Rightarrow = \sqrt{2}\left(\cos 135^\circ + i \sin 135^\circ\right)$

$= \sqrt{2}\left(-\frac{\sqrt{2}}{2} + i\frac{\sqrt{2}}{2}\right)$

$= -\frac{2}{2} + \frac{2}{2}i$

$= -1 + 1i$