

$$\omega = e^{2\pi i/5}$$

ω is a 5th root of unity:

$$\omega^5 = e^{2\pi i} = 1$$

$$\omega^5 - 1 = (\omega - 1)(\omega^4 + \omega^3 + \omega^2 + \omega + 1)$$

so that

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

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

$$= \left(\frac{\sqrt{5}-1}{4}\right) + i \sqrt{\frac{5+\sqrt{5}}{8}}$$

$$\cos(72^\circ) = \frac{\sqrt{5}-1}{4}$$

