$r = 16$, $\theta = 120^\circ = \frac{2\pi}{3}$ radians

We find all 4^{th} roots of $z = re^{i\theta}$

$= r(\cos\theta + i\sin\theta)$

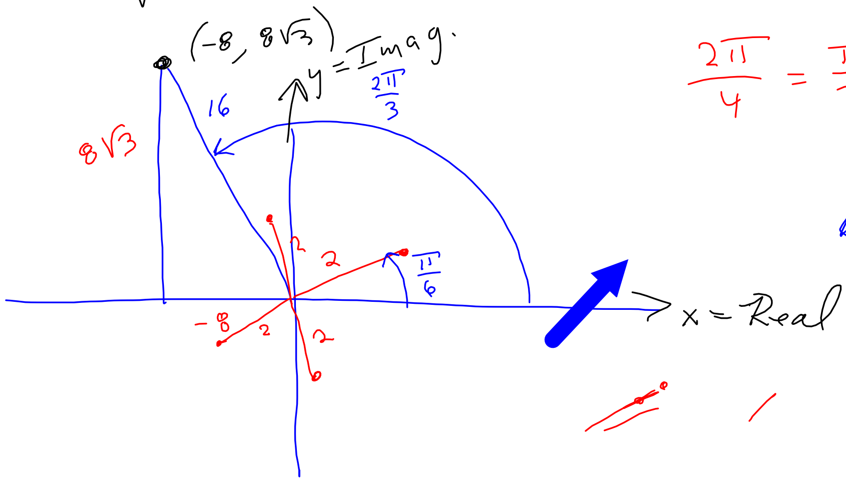
We solve the equation

$$z^4 = 16\left(\cos\left(\tfrac{2\pi}{3}\right) + i\sin\left(\tfrac{2\pi}{3}\right)\right) = 16\left(-\tfrac{1}{2} + i\,\tfrac{\sqrt{3}}{2}\right)$$

One solution is immediate: $= -8 + 8i\sqrt{3}$

$$\sqrt[4]{z^4} = \sqrt[4]{16}\ (\cos$$

$$\frac{2\pi}{4} = \frac{\pi}{2} \qquad \frac{\frac{2\pi}{3}}{4} = \frac{\pi}{6}$$



n^{th} roots of unity

$$x^n = 1$$

$$x^n - 1 = 0 \Rightarrow$$

cyclotomic polynomial

$$(x-1)\underbrace{(x^{n-1} + x^{n-2} + \dots + x^2 + x + 1)}$$

Always factors this way!

$x^7 = 1$ $\qquad x^7 - 1 = 0$

$x = 1$ is a soln.

$\frac{2\pi}{7}$

$1 = 1(\cos 0 + i\sin 0)$ 1

So. $\cos\left(\frac{2\pi}{7}\right) + i\sin\left(\frac{2\pi}{7}\right)$ 2

$\cos\left(\frac{4\pi}{7}\right) + i\sin\left(\frac{4\pi}{7}\right)$ 3

All the 7th roots of unity!

$\cos\left(\frac{6\pi}{7}\right) + i\sin\left(\frac{6\pi}{7}\right)$ 4

$\cos\left(\frac{8\pi}{7}\right) + i\sin\left(\frac{8\pi}{7}\right)$ 5

$\cos\left(\frac{10\pi}{7}\right) + i\sin\left(\frac{10\pi}{7}\right)$ 6

$\cos\left(\frac{12\pi}{7}\right) + i\sin\left(\frac{12\pi}{7}\right)$ 7