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Find all the roots of

$$z^5 - 1 = 0$$

Soln:

$$z^5 = 1$$

$$z = 1^{1/5}$$

$$z_0 = 1 \doteq 1\angle 0^\circ = 1\angle 2\pi$$

$$= 1\angle 4\pi$$

$$= 1\angle 6\pi$$

$$= 1\angle 8\pi$$

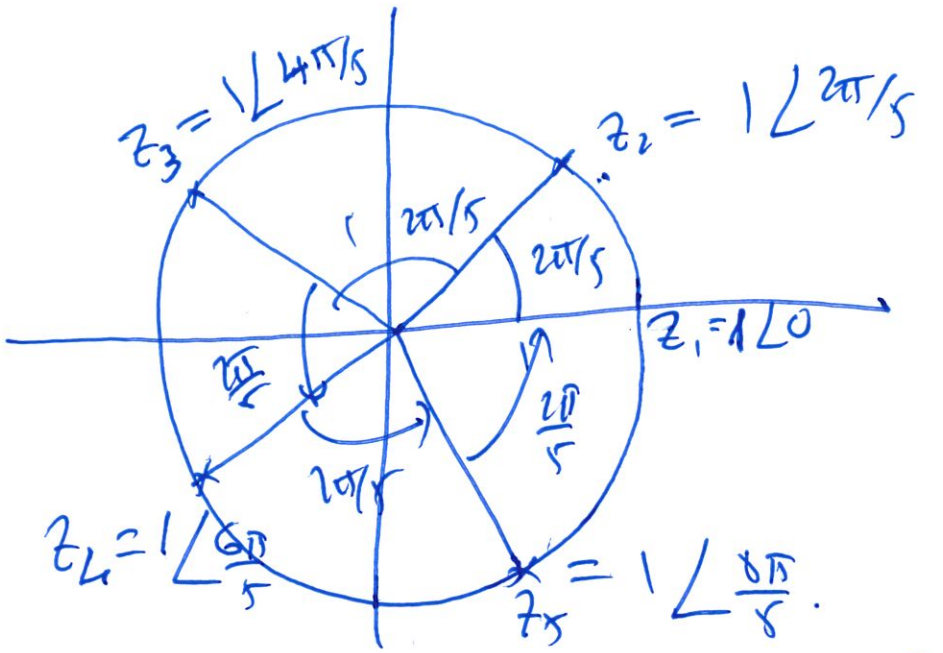
$$z_1 = (1\angle 0)^{1/5} = 1^{1/5}\angle\left(\tfrac{1}{5}\times 0\right) = 1\angle 0$$

$$z_2 = (1\angle 2\pi)^{1/5} = 1^{1/5}\angle\left(\tfrac{1}{5}\times 2\pi\right) = 1\angle\tfrac{2\pi}{5}$$

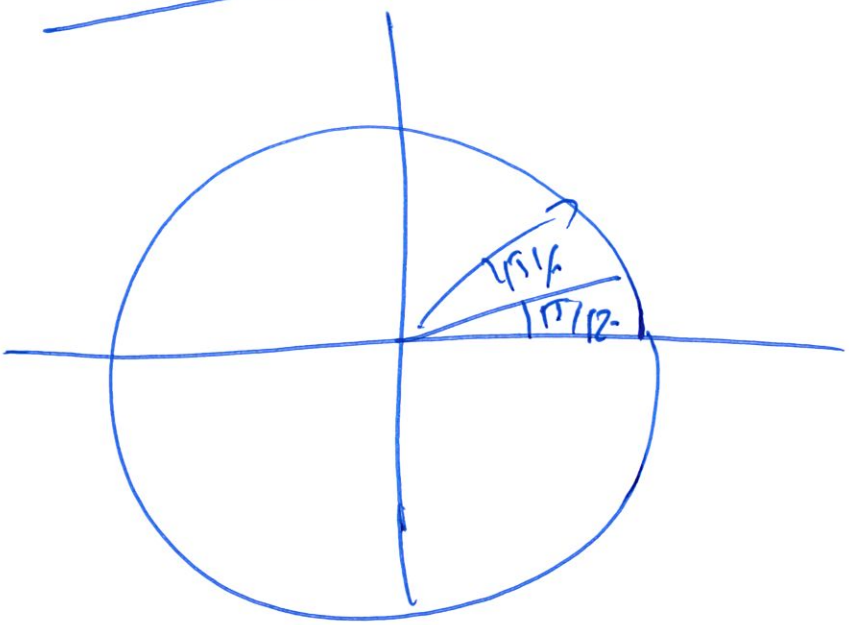
$$z_3 = (1\angle 4\pi)^{1/5} = 1\angle\tfrac{4\pi}{5}$$

$$z_4 = (1\angle 6\pi)^{1/5} = 1\angle\tfrac{6\pi}{5}$$

$$z_5 = (1\angle 8\pi)^{1/5} = 1\angle\tfrac{8\pi}{5}$$


$z_3 = 1\angle 4\pi/5$
$z_2 = 1\angle 2\pi/5$
$2\pi/5$
$2\pi/5$
$z_1 = 1\angle 0$
$\frac{2\pi}{5}$
$\frac{2\pi}{5}$
$2\pi/5$
$z_4 = 1\angle \frac{6\pi}{5}$
$z_5 = 1\angle \frac{8\pi}{5}$.

$z^{17} - 1 = 0$


$4\pi/4$
$\pi/12$

$$z^6 - 1 = j\sqrt{3}$$

Soln:

$$z^6 = 1 + j\sqrt{3}$$

$$z = \left(1 + j\sqrt{3}\right)^{1/6}$$

Converting into polar form gives:

$$1 + j\sqrt{3} = 2\angle\frac{\pi}{3}$$

$$\left(1 + j\sqrt{3}\right)^{1/6} = 2^{1/6}\angle\frac{1}{6}\times\frac{\pi}{3}$$

$$= 2^{1/6}\angle\frac{\pi}{18}$$