

2d 6  $z^4 + 11z^2 + 18 = 0$

$z^2 = t \Rightarrow t^2 + 11t + 18 = 0$   
 $\Delta = 121 - 72 = 49 = 7^2$

$t_1 = \frac{-11-7}{2} = -9 \Rightarrow z^2 = -9 \Rightarrow z_{1,2} = \pm 3i$

$t_2 = \frac{-11+7}{2} = -2 \Rightarrow z^2 = -2 \Rightarrow z_{3,4} = \pm \sqrt{2}i$

$(z+3i)(z+\sqrt{2}i)(z-\sqrt{2}i)(z-3i) = 0$   
 $\left[ \pm \sqrt{2}i, \pm 3i \right]$

2d 7 6

$\sqrt[6]{-64}$

$(2i)^6 = -64$

$z_1 = 2i$ . Każdy następny pierwiastek jest przesunięty o  $\frac{2\pi i}{n}$  gdzie  $n=6$ , tzn  $\frac{2\pi i}{6} = \frac{\pi i}{3}$

Jeśli  $z_1 = 2i$  to  $z_2 = z_1 \cdot e^{i\frac{2\pi}{6}} = z_1 e^{i\frac{\pi}{3}}$

$z_3 = z_2 e^{i\frac{\pi}{3}}, z_4 = z_3 e^{i\frac{\pi}{3}}, z_5 = z_4 e^{i\frac{\pi}{3}}, z_6 = z_5 e^{i\frac{\pi}{3}}$

$z_2 = z_1 \left( \cos \frac{\pi}{3} + i \sin \frac{\pi}{3} \right) = 2i \left( \frac{1}{2} + i \frac{\sqrt{3}}{2} \right) = -\sqrt{3} + i$

$z_3 = z_2 \left( \frac{1}{2} + i \frac{\sqrt{3}}{2} \right) = -\sqrt{3} - i$

$z_4 = z_3 \left( \frac{1}{2} + i \frac{\sqrt{3}}{2} \right) = -2i$

$z_5 = z_4 \left( \frac{1}{2} + i \frac{\sqrt{3}}{2} \right) = \sqrt{3} - i$

$z_6 = z_5 \left( \frac{1}{2} + i \frac{\sqrt{3}}{2} \right) = \sqrt{3} + i$