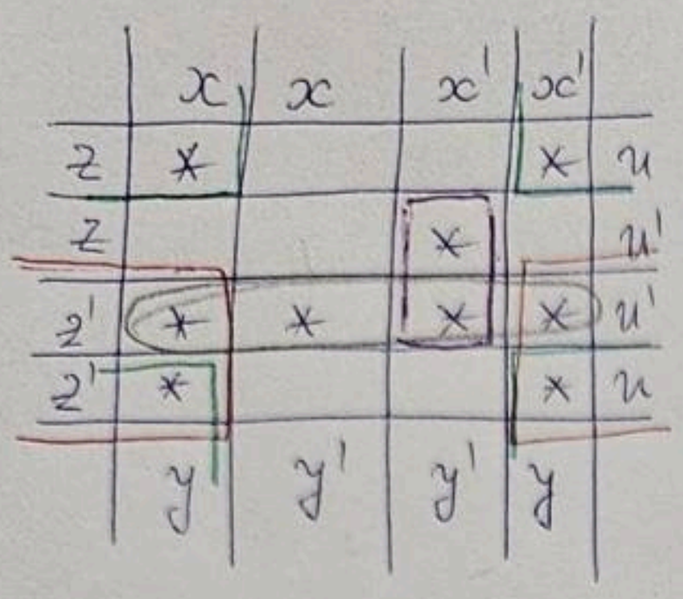
①



$f(x,y,z,u) = xyzu + xyz'u + xyz'u' + xy'z'u' + x'yzu + x'yz'u + x'yz'u' + x'y'zu' + x'y'z'u'$

P. I.: $z'u'$, yz', yu, $x'y'u'$

MDNF: $\phi = z'u' + yu + x'y'u'$

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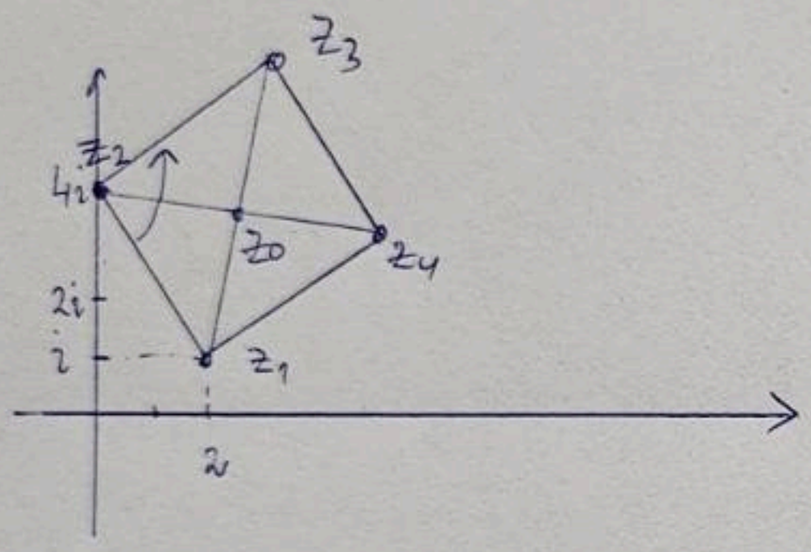
②



$z_1 = 2+i \;;\quad z_2 = 4i$

$z_3 = z_2 + (z_1 - z_2)e^{i\frac{\pi}{2}}$

$= 4i + (2+i-4i)\cdot i$

$= 4i + (2-3i)\cdot i = 3+6i$

$z_0 = \frac{z_1+z_3}{2} = \frac{2+i+3+6i}{2} = \frac{5}{2} + \frac{7}{2}i$

$|z_0 - z_1| = \left|\frac{1}{2} + \frac{5}{2}i\right| = \frac{\sqrt{26}}{2}$

$z_0 = \frac{z_2+z_4}{2} \Rightarrow z_4 = 2z_0 - z_2$

$z_4 = 5+7i-4i = 5+3i$

KRUŽNICA: $\left|z - \frac{5}{2} - \frac{7}{2}i\right| = \frac{\sqrt{26}}{2}$

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③ $p(x) = x^5 + \frac{x^4}{2} + \frac{x^3}{4} + \frac{x^2}{8} + \frac{x}{16} + \frac{1}{32} = \frac{1}{32}\left((2x)^5 + (2x)^4 + (2x)^3 + (2x)^2 + 2x + 1\right)$

$p(x) = \frac{1}{32}\cdot\sum_{k=0}^{5}(2x)^k = \frac{1-(2x)^6}{1-2x}$

$p(x) = 0 \iff \left((2x)^6 = 1 \;\wedge\; 2x \neq 1\right) \iff \left(2x = \sqrt{e^{0\cdot i}} = e^{\frac{0+2k\pi}{6}i} \;,\; k\in\{0,\pm1,\pm2,3\} \;\wedge\; x \neq \frac{1}{2}\right)$

$x \in \{\cancel{\frac{1}{2}}, \frac{1}{2}e^{\pm\frac{\pi}{3}i}, \frac{1}{2}e^{\pm\frac{2\pi}{3}i}, -\frac{1}{2}\}$

$p(x) = \left(x - \frac{1}{2}e^{\frac{\pi}{3}i}\right)\left(x - \frac{1}{2}e^{-\frac{\pi}{3}i}\right)\left(x - \frac{1}{2}e^{\frac{2\pi}{3}i}\right)\left(x - \frac{1}{2}e^{-\frac{2\pi}{3}i}\right)\left(x + \frac{1}{2}\right)$ NAD $\mathbb{C}$.

$= \left(x^2 - \frac{1}{2}x + \frac{1}{4}\right)\left(x^2 + \frac{1}{2}x + \frac{1}{4}\right)\left(x + \frac{1}{2}\right)$ NAD $\mathbb{R}$ i $\mathbb{Q}$.