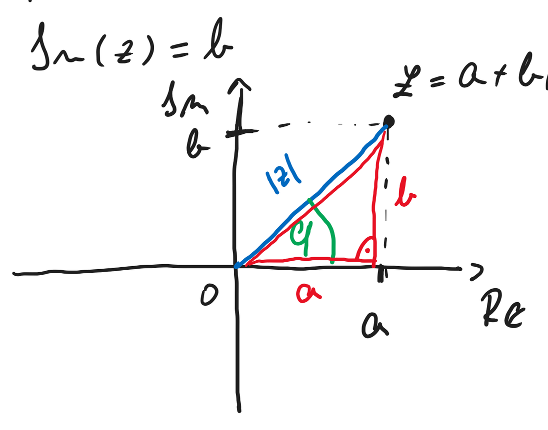
$\boxed{z = a + bi}$ $a, b \in \mathbb{R}$

$Re(z) = a$

$Im(z) = b$



$|z| = \sqrt{a^2 + b^2}$

$\sin\varphi = \frac{b}{|z|}$

$\cos\varphi = \frac{a}{|z|}$

$\sqrt{4} = 2$

$\sqrt{-4} = \sqrt{(-1)\cdot 4} = \sqrt{(-1)}\cdot\sqrt{4} = i\cdot 2$

$i = \sqrt{-1}$ $/^2$

$i^1 = i$
$i^2 = -1$
$i^3 = -i$
$i^4 = 1$
$i^5 = i$
$i^6 = -1$
$i^7 = -i$
$i^8 = 1$
$i^9 = i$

$z_1 = 5 - 5\sqrt{3}i$ $Re(z_1) = 5 = a_1$ $Im(z_1) = -5\cdot\sqrt{3} = b_1$ $z_1 = a_1 + b_1 i$

$z_2 = \sqrt{3} + 1i$ $Re(z_2) = \sqrt{3} = a_2$ $Im(z_2) = 1 = b_2$ $z_2 = a_2 + b_2 i$

$z = z_1 \pm z_2 = (a_1 \pm a_2) + (b_1 \pm b_2)i$

$z_1 + z_2 = 5 - 5\sqrt{3}i + \sqrt{3} + i = (\overbrace{5+\sqrt{3}}^{Re}) + (\overbrace{1 - 5\sqrt{3}}^{Im})i$

$z_1 - z_2 = 5 - 5\sqrt{3}i - (\sqrt{3} + i) = (5 - \sqrt{3}) + (-1 - 5\sqrt{3})i$

$5 - 5\sqrt{3}i - \sqrt{3} - i$

$z_1 \cdot z_2 = (a_1 + b_1 i)(a_2 + b_2 i) = (a_1 a_2 - b_1 b_2) + (a_1 b_2 + a_2 b_1)i$

$z_1 \cdot z_2 = (5 - 5\sqrt{3}i)\cdot(\sqrt{3} + i) = 5\cdot\sqrt{3} - 5\sqrt{3}\sqrt{3}\cdot i + 5i - 5\sqrt{3}(i\cdot i) =$ $i^2 = -1$ $i^2 = -1$

$= 5\cdot\sqrt{3} - 15i + 5i + 5\cdot\sqrt{3} = 10\sqrt{3} - 10i$

$\frac{z_2}{z_1} = \frac{\sqrt{3} + i}{5 - 5\sqrt{3}i}\cdot\frac{5 + 5\sqrt{3}i}{5 + 5\sqrt{3}i} = \frac{(\sqrt{3}+i)(5 + 5\sqrt{3}i)}{(5 - 5\sqrt{3}i)(5 + 5\sqrt{3}i)} = \frac{5\sqrt{3} + 5i + 5\sqrt{3}\sqrt{3}i + 5\sqrt{3}(i\cdot i)}{25 + 75} = \frac{0 + 20i}{100} = 0{,}2i$

$Re() = 0$

$Im() = 0{,}2$

$0{,}2i = 0 + 0{,}2i$

$1 = \frac{2}{2} = \frac{-\sqrt{5}}{-\sqrt{5}} = \frac{x+3}{x+3} = \frac{♡}{♡}$

$a = 5 \rightarrow a^2 = 25$

$b = -5\sqrt{3} \rightarrow b^2 = 25\cdot 3 = 75$

$z = a + bi$

$\bar{z} = a - bi$

$z\cdot\bar{z} = (a + bi)(a - bi) = a^2 + b^2$ $a, b \in \mathbb{R}$

$(s + r)(s - r) = s^2 - r^2$

$a^2 - (bi)^2$

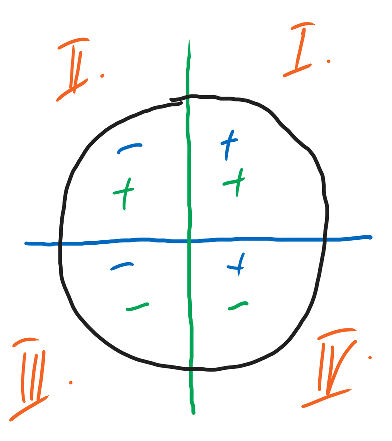
$a^2 - b^2 i^2$ -1

$i^{-1} = \frac{1}{i}\cdot\frac{i}{i} = \frac{i}{i^2} = \frac{i}{-1} = -i$ $i^2 = -1$

$i^{-2} = \frac{1}{i^2} = \frac{1}{-1} = -1$

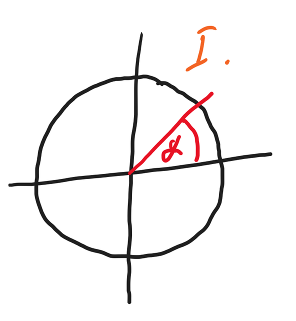
$i^{-3} = \frac{1}{i^3} = \frac{1}{i^2\cdot i} = \frac{1}{-i} = -1\cdot\left(\frac{1}{i}\right) = -1\cdot(-i) = i$

$z = \underbrace{a + bi}_{\text{ALGEBRAICKÝ TVAR}} = \underbrace{|z|(\cos\varphi + i\sin\varphi)}_{\text{GONIOMETRICKÝ TVAR}} = \underbrace{|z|\,e^{i\varphi}}_{\text{EXPONENCIÁLNÍ TVAR}}$

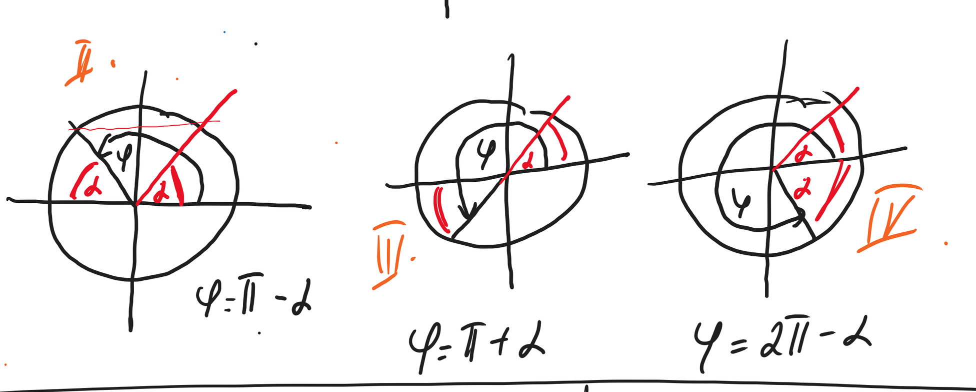


cos φ

sin φ

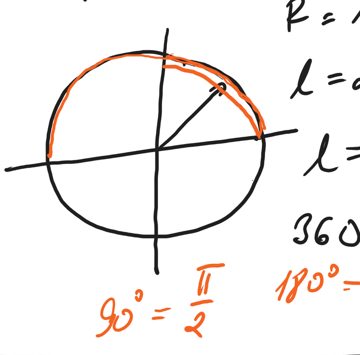


$\varphi = \alpha$



$\varphi = \pi - \alpha$ $\varphi = \pi + \alpha$ $\varphi = 2\pi - \alpha$

	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π	$\frac{3}{2}\pi$	2π
$\sin\varphi$	$\frac{\sqrt{0}}{2} = 0$	$\frac{\sqrt{1}}{2} = \frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{4}}{2} = 1$	0	-1	0
$\cos\varphi$	$\frac{\sqrt{4}}{2} = 1$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{1}}{2} = \frac{1}{2}$	$\frac{\sqrt{0}}{2} = 0$	-1	0	1



$R = 1$

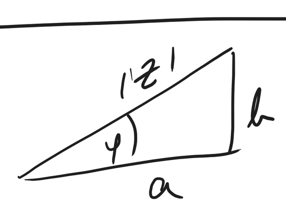
$l = 2\pi R$

$l = 2\pi$

$360 \rightarrow 2\pi$

$90° = \frac{\pi}{2}$ $180° = \pi$

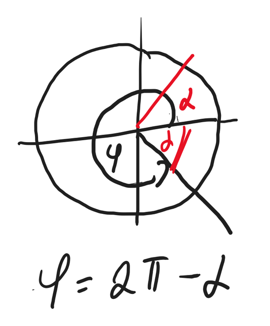
$z_1 = 5 - 5\sqrt{3}i$



$z = |z|(\cos\varphi + i\sin\varphi)$

$|z| = \sqrt{5^2 + (-5\sqrt{3})^2} = \sqrt{25 + 75}$

$|z| = 10$



$\cos\varphi = \frac{a}{|z|} = \frac{5}{10} = \frac{1}{2}$

$\varphi = 2\pi - \alpha$

$\varphi = 2\pi - \frac{\pi}{3} = \frac{5\pi}{3}$

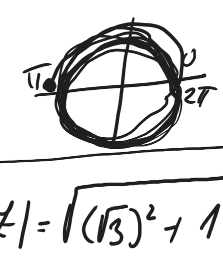
$\sin\varphi = \frac{b}{|z|} = \frac{-5\sqrt{3}}{10} = -\frac{\sqrt{3}}{2}$

$z_1 = 5 - 5\sqrt{3}i = 10\left(\cos\frac{5\pi}{3} + i\sin\frac{5\pi}{3}\right) = 10\cdot e^{\frac{5\pi}{3}i}$

$z^n = |z|^n(\cos n\varphi + i\sin n\varphi)$

$z_1^9 = (5 - 5\sqrt{3}i)^9 = -10^9$

$z_1^9 = 10^9\cdot\left(\cos 9\cdot\frac{5\pi}{3} + i\sin 9\cdot\frac{5\pi}{3}\right) = 10^9(\overset{-1}{\cos 15\pi} + i\overset{0}{\sin 15\pi}) = 10^9(-1 + 0i)$



$z_2 = \sqrt{3} + i$

$z_2^{12} = 2^{12}$

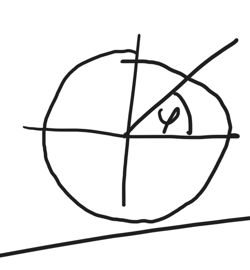
$|z| = \sqrt{(\sqrt{3})^2 + 1^2} = \sqrt{3 + 1} = 2$

$\left.\begin{array}{l}\cos\varphi = \frac{\sqrt{3}}{2}\\ \sin\varphi = \frac{1}{2}\end{array}\right\}\ \frac{\pi}{6}$

$z_2 = 2\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)$

$z_2^{12} = 2^{12}\left(\cos 12\cdot\frac{\pi}{6} + i\sin 12\frac{\pi}{6}\right) =$

$= 2^{12}(\underset{1}{\cos 2\pi} + i\overset{0}{\sin 2\pi}) = 2^{12}$



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

$z^4 = 4^4\left(-\frac{1}{2} - \frac{\sqrt{3}}{2}i\right)$

$\frac{4\pi}{3} = \pi + \frac{\pi}{3}$ $= \alpha$

$\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$

$\cos\frac{\pi}{3} = \frac{1}{2}$