Umwandeln komplexer Zahlen

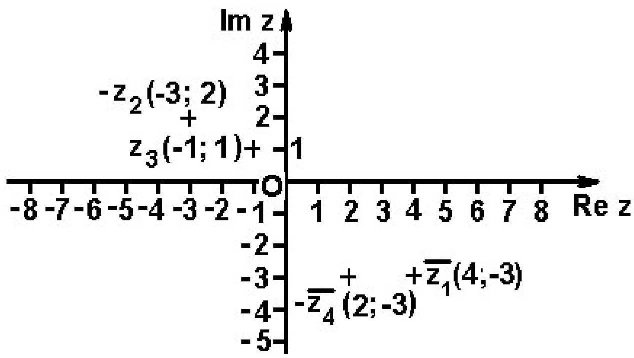
Wandeln Sie jeweils die gegebene Form in alle anderen Formen um!

	Zahlenpaar (a; b)	Normalform	Polarform	Exponentialform
1)	$z_1(2;-4)$	$z_1 = 2-4\cdot i$	$z_1 = \sqrt{20}(\cos 296{,}6° + i\cdot\sin 296{,}6°)$	$z_1 = \sqrt{20}\cdot e^{i\cdot 296{,}6°}$
2)	$z_2(-1;5)$	$z_2 = -1+5\cdot i$	$z_2 = \sqrt{26}(\cos 101{,}3° + i\cdot\sin 101{,}3°)$	$z_2 = \sqrt{26}\cdot e^{i\cdot 101{,}3°}$
3)	$z_3(-\frac{3}{2}\sqrt{3};\frac{1}{2})$	$z_3 = -\frac{3}{2}\sqrt{3}+\frac{1}{2}\cdot i$	$z_3 = 3(\cos 150° + i\cdot\sin 150°)$	$z_3 = 3e^{i\cdot 150°}$
4)	$z_4(-2\sqrt{2};-2\sqrt{2})$	$z_4 = -2\sqrt{2}-2\sqrt{2}\cdot i$	$z_4 = 4(\cos 225° + i\cdot\sin 225°)$	$z_4 = 4e^{i\cdot 225°}$
5)	$z_5(1;0)$	$z_5 = 1$	$z_5 = \cos 0° + i\cdot\sin 0°$	$z_5 = e^{i\cdot 0°}$
6)	$z_6(0;-1)$	$z_6 = -i$	$z_6 = \cos 270° + i\cdot\sin 270°$	$z_6 = e^{i\cdot 270°}$
7)	$z_1(-1;0)$	$z_7 = -1$	$z_7 = \cos\pi + i\cdot\sin\pi$	$z_8 = e^{i\cdot\pi}$
8)	$z_1(0;1)$	$z_8 = i$	$z_8 = \cos\frac{\pi}{2} + i\cdot\sin\frac{\pi}{2}$	$z_8 = e^{i\cdot\frac{\pi}{2}}$

Rechnen in C

geg.: $z_1 = 4+3\cdot i \quad z_2 = 3-2\cdot i \quad z_3 = -1+i \quad z_4 = -2-3\cdot i$

1) Stelle die Zahlen $\overline{z_1}$, $-z_2$, z_3 und $-\overline{z_4}$ in der GAUSSschen Zahlenebene dar!



2) Berechne in Normalform!

a) $z_1 - z_2 = 1+5\cdot i$ b) $z_2\cdot z_3 = -1+5\cdot i$ c) $z_3 : z_1 = -\frac{1}{25}+\frac{7}{25}\cdot i$ d) $z_4(z_2 - z_3) = -17-6\cdot i$

3) Löse in C!

a) $z^2 - 4z + 13 = 0 \rightarrow z_1 = 2+3\cdot i \quad z_2 = 2-3\cdot i$

b) $z^3 + 5z = 0 \rightarrow z_1 = 0 \quad z_2 = \sqrt{5}\cdot i \quad z_3 = -\sqrt{5}\cdot i$

c) $z^3 - z^2 + z + 1 = 0 \rightarrow z_1 = 1 \quad z_2 = i \quad z_3 = -i$

4) Berechne in Polarform!

a) ${z_1}^3$: $z_1 = 5(\cos 36{,}9° + i\cdot\sin 36{,}9°) \rightarrow {z_1}^3 = 125(\cos 110{,}6° + i\cdot\sin 110{,}6°)$

b) ${z_2}^4$: $z_2 = \sqrt{13}(\cos 326{,}3° + i\cdot\sin 326{,}3°) \rightarrow {z_2}^4 = 169(\cos 1305{,}2° + i\cdot\sin 1305{,}2°)$

$= 169(\cos 225{,}2° + i\cdot\sin 225{,}2°)$

5) Berechne alle Wurzeln in C!

a) $z^4 = 81(\cos 200° + i\cdot\sin 200°)$

$k=0: \rightarrow z_1 = 3(\cos 50° + i\cdot\sin 50°)$

$k=1: \rightarrow z_2 = 3(\cos 140° + i\cdot\sin 140°)$

$k=2: \rightarrow z_3 = 3(\cos 250° + i\cdot\sin 250°)$

$k=3: \rightarrow z_4 = 3(\cos 320° + i\cdot\sin 320°)$

b) $z^5 = 32(\cos 200° + i\cdot\sin 200°)$

$k=0: \rightarrow z_1 = 2\cdot e^{i\cdot 40°}$

$k=1: \rightarrow z_2 = 2\cdot e^{i\cdot 112°}$

$k=2: \rightarrow z_3 = 2\cdot e^{i\cdot 184°}$

$k=3: \rightarrow z_4 = 2\cdot e^{i\cdot 256°}$

$k=4: \rightarrow z_5 = 2\cdot e^{i\cdot 328°}$