Q20: Given is the complex number $z = -\frac{1}{2} - \frac{\sqrt{3}}{2}i$. In polar form, the number can be represented with radius $r = 1$ and $\varphi = \frac{\pi}{3} + \ldots$

- -1
- 0
- π

Q21: Given is the complex number $z = -\frac{4}{5} + \frac{3}{5}i$. In polar form, the number can be represented with radius $r = 5$ and $\varphi = \arctan\left(-\frac{3}{4}\right) + \ldots$

- $-\pi$
- 0
- π

Q22: Calculate $(\sqrt{3}+i)^7$

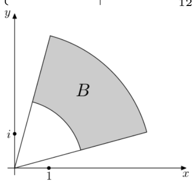
- $(\sqrt{3}+i)^7 = 128e^{-i5\pi/6}$
- $(\sqrt{3}+i)^7 = 64e^{-i5\pi/6}$
- $(\sqrt{3}+i)^7 = 128e^{-i7\pi/6}$
- $(\sqrt{3}+i)^7 = e^{-i7\pi/6}$

Q23: Calculate the absolute value of $(1+i)^{2000}$

- $\sqrt{2}$
- -2^{1000}
- $(2i)^{1000}$
- $2^{1000}e^{\frac{\pi i}{4}}$
- 2^{2000}

Q24: The figure shows the area B in the complex plane with

$$B = \left\{ z = re^{i\varphi} \in \mathbb{C} \;\middle|\; 2 \le r \le 4,\ \frac{\pi}{12} \le \varphi \le \frac{5\pi}{12} \right\}$$



Decide for which numbers z_1 and z_2 the product $z = z_1 \cdot z_2$ is located in B.

- $z_1 = \frac{3\sqrt{3}}{2} + \frac{3}{2}i$, $z_2 = 2\sqrt{2} + 2\sqrt{2}i$
- $z_1 = 5e^{\frac{\pi}{15}i}$, $z_2 = \frac{1}{2}e^{\frac{\pi}{6}i}$
- $z_1 = 3e^{i\frac{\pi}{3}}$, $z_2 = e^{i\frac{\pi}{4}}$

Q25: Given are the complex numbers $z_1 = 4\left(\cos\left(\frac{5\pi}{6}\right) + i\sin\left(\frac{5\pi}{6}\right)\right)$ and $z_2 = 1 + i\sqrt{3}$. Which statements about $z = z_1/z_2$ are correct?

- $\arg(z) = \pi$
- $\arg(z) = \pi/2$
- $\arg(z) = 3$
- $\arg(z) = 4$

Q26: Let $z \in \mathbb{C}$. For which complex number $w \in \mathbb{C}$ does the product zw result from z through a clockwise rotation by 45° and a reduction of length by a factor 0.5?

- $w = 2e^{-i\pi/2}$
- $w = \frac{1}{2}e^{-i\pi/2}$
- $w = \frac{1}{2}e^{i\pi/2}$
- So ein w gibt es nicht

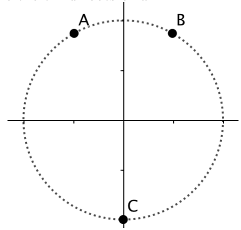
Q27: For any complex $c \ne 0$, the equation $z^n = c$ has exactly n solutions. True or false?

- True
- False
- Don't know

Q28: If you had to solve the equation $z^3 = -3 + 3i$, what would be the first step?

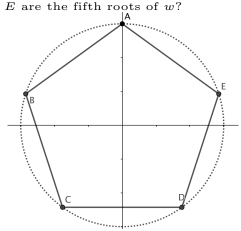
- You plug $z = x+iy$ into the equation and solve.
- You calculate the polar form of $-3 + 3i$

Q29: Is there a $w \in \mathbb{C}$, such that the points A, B und C are the third roots of w?



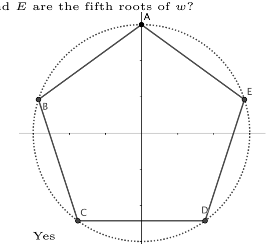
- Yes
- No

Q30: Is there a $w \in \mathbb{C}$, such that the points A, B, C, D and E are the fifth roots of w?



- Yes
- No

Q31: Is there a *real* w, such that the points A, B, C, D and E are the fifth roots of w?



- Yes
- No

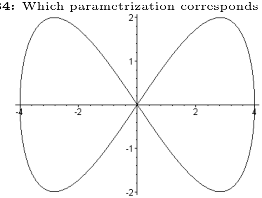
Q32: Every polynomial of degree three must have at least one real point where it is zero.

- True
- False

Q33: Every *real* polynomial of degree three must have at least one real point where it is zero.

- True
- False

Q34: Which parametrization corresponds to the figure?



- $(4\cos(t), 2\sin(2t))$
- $(4\cos(2t), 2\sin(2t))$
- $(4\cos(t), 2\sin(t))$
- $(-4\cos(2t), 2\sin(2t))$

Q35: Which of the following parameterizations parametrizes a curve other than a circle of radius R?

- $(R\cos(t), R\sin(t))$
- $(R\cos(t^2), R\sin(t^2))$
- $(R\cos(-t), R\sin(-t))$
- $(R\cos(t), R\sin(t^2))$