

Precalculus · Complex Numbers in Polar Form · Test Answer Key

Common Core N-CN.B.4, N-CN.B.5, N-CN.B.6, N-CN.A.3 · mathovore.fr

This precalculus complex polar test answer key gives the full solution and the scoring guide for each of the 9 test questions on complex numbers in polar form.

Use this key to grade the complex numbers test. Each solution shows full work, and the scoring note explains how every point is earned. The maximum is 20 points; accept equivalent forms such as decimals rounded correctly.

PrecalculusCommon Core: N-CN.B.4 · N-CN.B.5 · N-CN.B.6 · N-CN.A.3

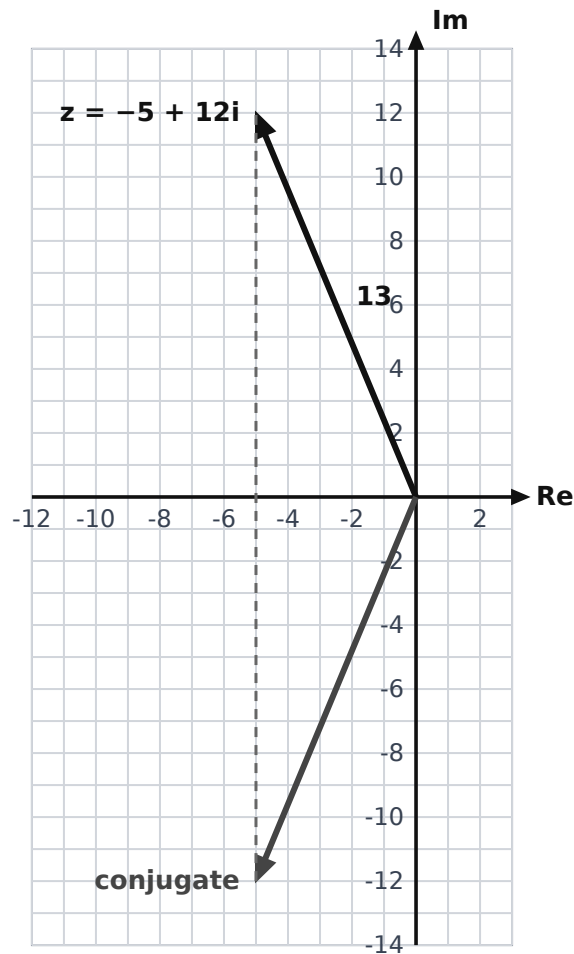
Precalculus Complex Polar Test Answer Key: questions 1-5

Question 1: Modulus and conjugate (2 points)

a. $\sqrt{25+144}=13$

b. $\bar{z} = -5-12i$

Scoring: 1 point for each correct part.



The conjugate is the reflection across the real axis.

Question 2: Complex quotient (2 points)

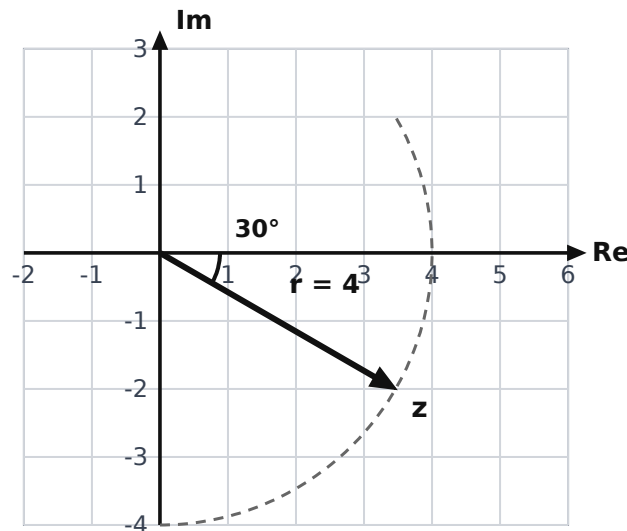
Multiply by the conjugate of the denominator: $\frac{(10+5i)(2+i)}{(2-i)(2+i)} = \frac{20+10i+10i+5i^2}{5} = \frac{15+20i}{5} = 3+4i$.

Scoring: 1 point for multiplying by the conjugate correctly (denominator 5); 1 point for the final answer.

Question 3: Polar form of a complex number (3 points)

- $r = \sqrt{12+4} = 4$
- $\tan \theta = \frac{-2}{2\sqrt{3}} = -\frac{1}{\sqrt{3}}$, reference angle 30° , quadrant IV: $\theta = 330^\circ$
- $z = 4(\cos 330^\circ + i \sin 330^\circ)$

Scoring: 1 point per part. In part (b), a value of -30° is also accepted.



Modulus 4 and argument 330° .

Question 4: Polar to rectangular (2 points)

- $8\left(-\frac{\sqrt{3}}{2}\right) + 8 \cdot \frac{1}{2}i = -4\sqrt{3} + 4i$
- $6(0) + 6(-1)i = -6i$

Scoring: 1 point for each correct part.

Question 5: Products and quotients in polar form (2 points)

$$z_1 z_2 = 8(\cos 90^\circ + i \sin 90^\circ) = 8i. \quad \frac{z_1}{z_2} = 2(\cos 50^\circ + i \sin 50^\circ).$$

Scoring: 1 point for the product (modulus 8, angle 90°), 1 point for the quotient (modulus 2, angle 50°); the rectangular form is required in the product to earn its point.

Precalculus Complex Polar Test Answer Key: questions 6-9

Question 6: De Moivre's theorem (3 points)

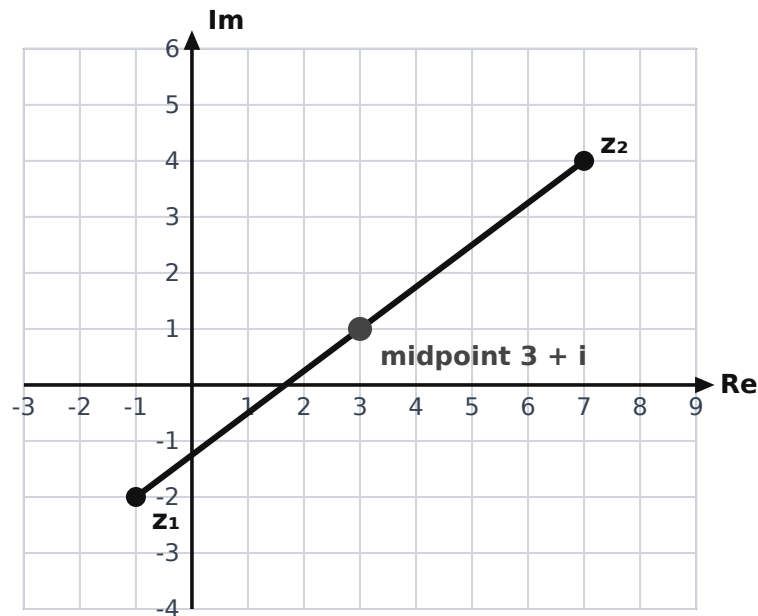
- $r = \sqrt{2}$, $\theta = 45^\circ$, so $(\sqrt{2})^{10}(\cos 450^\circ + i \sin 450^\circ) = 32(\cos 90^\circ + i \sin 90^\circ) = 32i$
- We need $24n = 360$ as the first multiple of 360: $n = 15$

Scoring: part (a) 1 point for the polar form with $r^{10} = 32$ and $\theta = 450^\circ$, 1 point for $32i$; part (b) 1 point.

Question 7: Distance and midpoint (2 points)

Distance: $|z_1 - z_2| = |-8 - 6i| = \sqrt{64 + 36} = 10$ (1 point). Midpoint: $\frac{6+2i}{2} = 3+i$ (1 point).

Scoring: 1 point for the distance, 1 point for the midpoint.

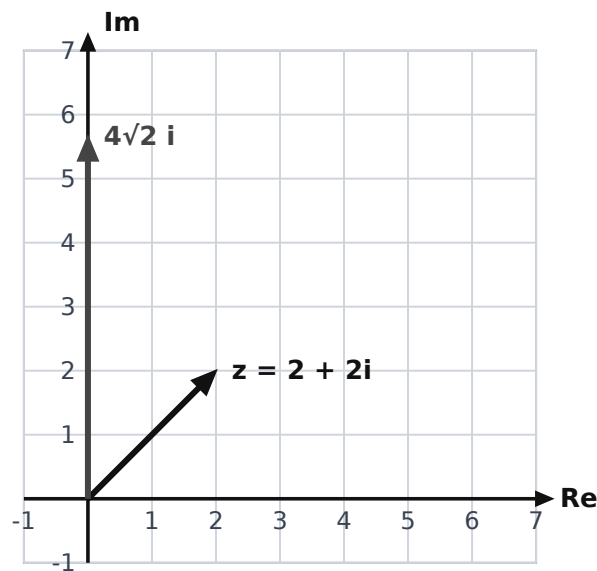


Length 10 and midpoint $3 + i$.

Question 8: Rotation and scaling (2 points)

$z = 2\sqrt{2}(\cos 45^\circ + i\sin 45^\circ)$, so $zw = 4\sqrt{2}(\cos 90^\circ + i\sin 90^\circ)$ (1 point) $= 4\sqrt{2}i$ (1 point).

Scoring: 1 point for the polar form, 1 point for the rectangular form.



The product is z rotated 45° and stretched by 2.

Question 9: Circuit current (2 points)

$|Z| = \sqrt{36+64} = 10$ ohms (1 point). $I = \frac{50(6-8i)}{100} = 3-4i$ amperes (1 point).

Scoring: 1 point for the modulus, 1 point for the current.

Scoring summary

Total
20 points: add the points of every question of this precalculus complex polar test answer key.

How to use this precalculus complex polar test answer key

Use this precalculus complex polar test answer key to score the test fairly and to see which skills need more practice.

