

Precalculus - Polar Form and De Moivre's Theorem - Worksheet

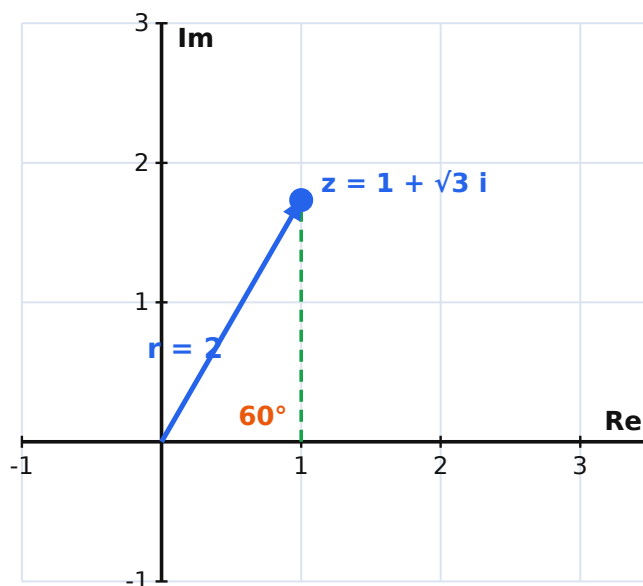
Common Core N-CN.B.4, N-CN.B.5, N-CN.B.6 · maths-pdf.fr/en/

Name: _____ Class: _____ Date: ____/____/____

These 20 problems practice polar form and De Moivre's theorem (Common Core N-CN.B.4, N-CN.B.5 and N-CN.B.6). You will convert between forms, multiply and divide in polar form, find powers and find nth roots of complex numbers.

Precalculus · Common Core State Standards: **N-CN.B.4, N-CN.B.5, N-CN.B.6**

Exercise 1 - Modulus and argument



The point z in the plane.

Find the modulus and argument of $z = 1 + \sqrt{3}i$ and write z in polar form.

Exercise 2 - Quadrant II

Write $-3 + 3i$ in polar form.

Exercise 3 - On an axis

Write $-4i$ in polar form.

Exercise 4 - Polar to rectangular

Write $6(\cos 120^\circ + i\sin 120^\circ)$ in the form $a+bi$.

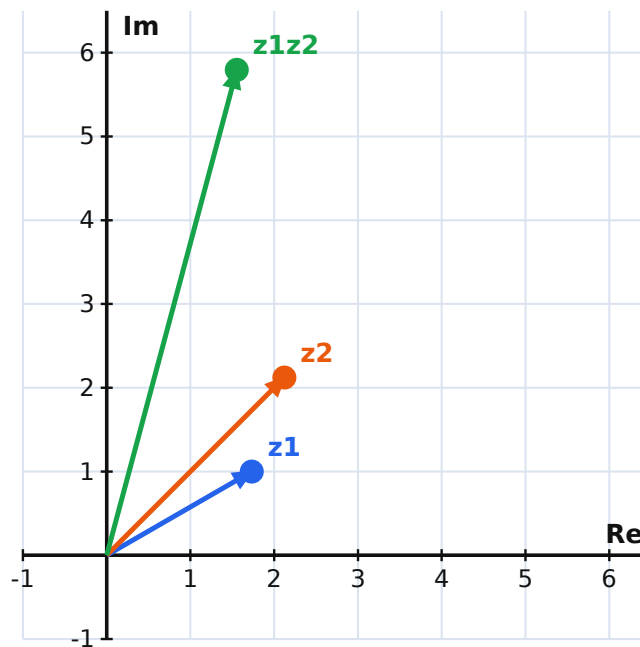
Exercise 5 - Polar to rectangular in radians

Write $4\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)$ in the form $a+bi$.

Exercise 6 - Quadrant IV

Write $5-5i$ in polar form.

Exercise 7 - Multiply in polar form



Two complex numbers and their product.

Multiply $2(\cos 30^\circ + i\sin 30^\circ)$ and $3(\cos 45^\circ + i\sin 45^\circ)$. Give the answer in polar and rectangular form (three decimals).

Exercise 8 - Divide in polar form

Divide $12 \operatorname{cis} 200^\circ$ by $4 \operatorname{cis} 50^\circ$.

Exercise 9 - Check with rectangular multiplication

Multiply $(1+i)(\sqrt{3}+i)$ in polar form and check in rectangular form.

Exercise 10 - De Moivre with a unit modulus

Evaluate $(\cos 20^\circ + i \sin 20^\circ)^9$.

Exercise 11 - Power of $1 + i$

Evaluate $(1+i)^8$.

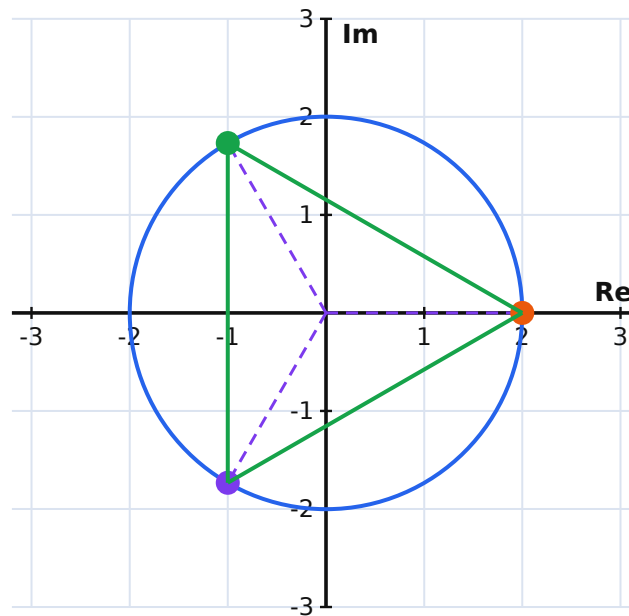
Exercise 12 - Power with a negative angle

Evaluate $(\sqrt{3}-i)^6$.

Exercise 13 - Power in rectangular form

Evaluate $[2(\cos 15^\circ + i \sin 15^\circ)]^4$ in the form $a+bi$.

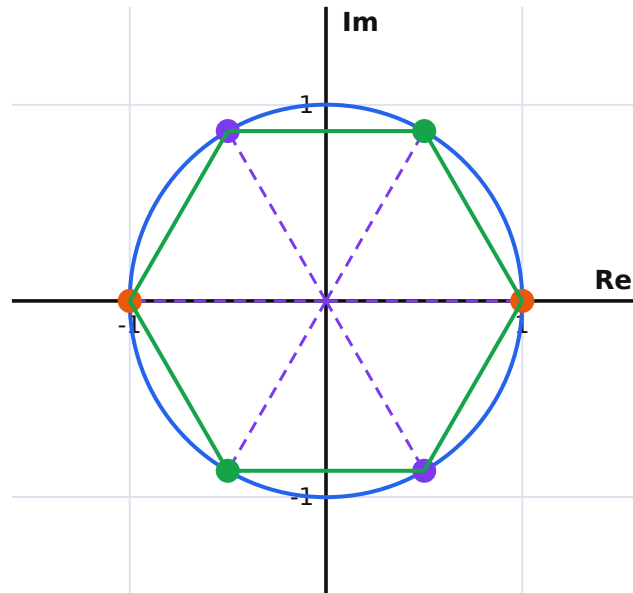
Exercise 14 - Cube roots of 8



Three points on a circle.

Find the three cube roots of 8 in polar and rectangular form.

Exercise 15 - Sixth roots of unity



A hexagon on the unit circle.

List the sixth roots of unity as $\text{cis } \theta$.

Exercise 16 - Fourth roots of -16

Find the four fourth roots of -16 in rectangular form.

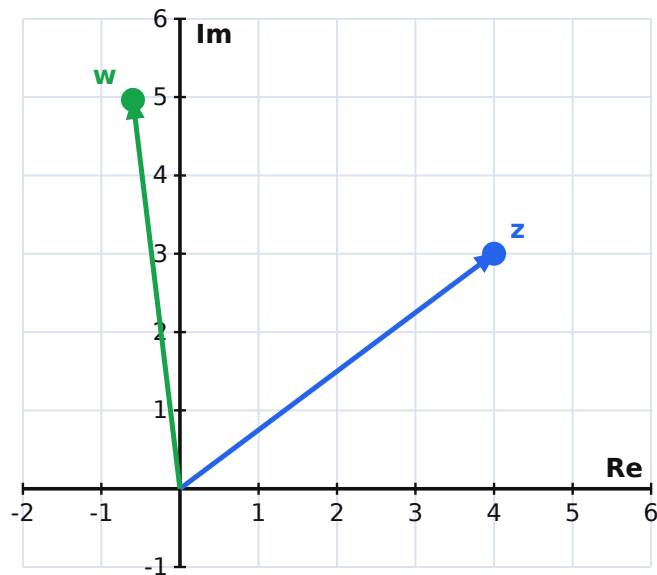
Exercise 17 - Solve $z^3 = 27i$

Solve $z^3 = 27i$.

Exercise 18 - AC circuit

An impedance is $Z = 3 + 4i$ ohms and the current is $I = 10$ amps (modulus 10, angle 0°). Write Z in polar form, then find the voltage $V = IZ$ in polar form.

Exercise 19 - Rotate a point



A rotation of 60 degrees.

Multiplying by $\text{cis } 60^\circ$ rotates a point 60° counterclockwise about the origin. Rotate $4+3i$ by 60° and give the result to two decimals.

Exercise 20 - Cube root of unity

Let $\omega = -\frac{1}{2} + \frac{\sqrt{3}}{2}i$. Show that $\omega^3 = 1$ and $1 + \omega + \omega^2 = 0$.