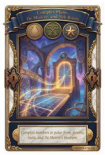
Complex Plane, De Moivre, and Nth Roots

Complex numbers in polar form, powers, roots, and De Moivre's theorem.

Name _____ Date _____

32 main · 2-up grid · 11 pages · visible side quests

Completion Reward



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1. What is i^2?

A. -1
B. 1
C. i
D. 0

1.1. The modulus of 6 + 8i is:

A. 10
B. 14
C. 48
D. 64

1.2. The argument of a complex number tells you its:

A. real part
B. imaginary part
C. angle from the positive real axis
D. modulus

1.3. The conjugate of -3 + 5i is:

A. 3 + 5i
B. -3 - 5i
C. 3 - 5i
D. -3 + 5i

1.4. Writing a complex number in polar form is especially helpful for:

A. adding unlike terms
B. raising to powers and finding roots
C. graphing lines
D. solving systems by elimination

1.5. How many cube roots does a nonzero complex number have?

A. 1
B. 2
C. 3
D. 6

2. In the complex plane, what does the vertical axis represent?

A. Real values
B. Radius values only
C. Angles only
D. Imaginary values

2.1. The modulus of 6 + 8i is:

A. 10
B. 14
C. 48
D. 64

2.2. The argument of a complex number tells you its:

A. real part
B. imaginary part
C. angle from the positive real axis
D. modulus

2.3. The conjugate of -3 + 5i is:

A. 3 + 5i
B. -3 - 5i
C. 3 - 5i
D. -3 + 5i

2.4. Writing a complex number in polar form is especially helpful for:

A. adding unlike terms
B. raising to powers and finding roots
C. graphing lines
D. solving systems by elimination

2.5. How many cube roots does a nonzero complex number have?

A. 1
B. 2
C. 3
D. 6

3. What is the conjugate of 4 - 7i?

A. -4 + 7i
B. 7 - 4i
C. 4 - 7i
D. 4 + 7i

3.1. The modulus of 6 + 8i is:

A. 10
B. 14
C. 48
D. 64

3.2. The argument of a complex number tells you its:

A. real part
B. imaginary part
C. angle from the positive real axis
D. modulus

3.3. The conjugate of -3 + 5i is:

A. 3 + 5i
B. -3 - 5i
C. 3 - 5i
D. -3 + 5i

3.4. Writing a complex number in polar form is especially helpful for:

A. adding unlike terms
B. raising to powers and finding roots
C. graphing lines
D. solving systems by elimination

3.5. How many cube roots does a nonzero complex number have?

A. 1
B. 2
C. 3
D. 6

4. What does the modulus of a complex number measure?

A. Its slope
B. Its distance from the origin in the complex plane
C. Its imaginary part only
D. Its argument only

4.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

4.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

4.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

4.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

4.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

5. Which expression is a polar-form description of a complex number?

A. a + bi
B. r(theta + i)
C. r(cos(theta) + i sin(theta))
D. r^2 = x^2 + y^2

5.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

5.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

5.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

5.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

5.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

6. Which pattern is used in De Moivre's theorem?

A. Raise the modulus to the power and multiply the angle by the power
B. Raise both modulus and angle to the power
C. Keep the modulus and add the power to the angle
D. Square the real and imaginary parts separately

6.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

6.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

6.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

6.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

6.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

7. How many distinct complex fourth roots does a nonzero complex number have?

A. 1
B. 2
C. 8
D. 4

7.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

7.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

7.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

7.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

7.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

8. What is the argument of a complex number?

A. Its distance from the origin
B. Its real part
C. Its modulus squared
D. Its angle from the positive real axis

8.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

8.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

8.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

8.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

8.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

9. To compute a high power of a complex number efficiently, what is the best first step?

A. Multiply it out term by term immediately
B. Take the conjugate
C. Convert to polar form
D. Set the number equal to zero

9.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

9.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

9.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

9.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

9.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

10. To find all cube roots of a complex number, what is the best first step?

A. Take the conjugate
B. Write the number in polar form
C. Differentiate it
D. Put it in a table

10.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

10.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

10.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

10.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

10.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

11. A student says the conjugate of -3 + 2i is 3 + 2i. What is wrong?

A. The real part should stay -3
B. The imaginary part should stay +2i
C. The conjugate should be -3 - 2i^2
D. Nothing is wrong

11.1. The modulus of 6 + 8i is:

A. 10
B. 14
C. 48
D. 64

11.2. The argument of a complex number tells you its:

A. real part
B. imaginary part
C. angle from the positive real axis
D. modulus

11.3. The conjugate of -3 + 5i is:

A. 3 + 5i
B. -3 - 5i
C. 3 - 5i
D. -3 + 5i

11.4. Writing a complex number in polar form is especially helpful for:

A. adding unlike terms
B. raising to powers and finding roots
C. graphing lines
D. solving systems by elimination

11.5. How many cube roots does a nonzero complex number have?

A. 1
B. 2
C. 3
D. 6

12. A student says the modulus of 3 + 4i is 7. What is wrong?

A. Modulus uses the Pythagorean theorem, not direct addition
B. The real and imaginary parts should be subtracted
C. Modulus should always equal the real part for positive numbers
D. The modulus of 3 + 4i is undefined

12.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

12.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

12.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

12.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

12.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

13. Find the modulus of 3 + 4i. Answer with a number.

13.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

13.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

13.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

13.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

13.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

14. Find the modulus of -5 + 12i. Answer with a number.

14.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

14.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

14.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

14.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

14.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

15. Compute (2i)(-3i). Answer with a number.

15.1. The modulus of 6 + 8i is:

A. 10
B. 14
C. 48
D. 64

15.2. The argument of a complex number tells you its:

A. real part
B. imaginary part
C. angle from the positive real axis
D. modulus

15.3. The conjugate of -3 + 5i is:

A. 3 + 5i
B. -3 - 5i
C. 3 - 5i
D. -3 + 5i

15.4. Writing a complex number in polar form is especially helpful for:

A. adding unlike terms
B. raising to powers and finding roots
C. graphing lines
D. solving systems by elimination

15.5. How many cube roots does a nonzero complex number have?

A. 1
B. 2
C. 3
D. 6

16. Compute (4 + 3i) + (2 - i). Answer in standard form.

16.1. The modulus of 6 + 8i is:

A. 10
B. 14
C. 48
D. 64

16.2. The argument of a complex number tells you its:

A. real part
B. imaginary part
C. angle from the positive real axis
D. modulus

16.3. The conjugate of -3 + 5i is:

A. 3 + 5i
B. -3 - 5i
C. 3 - 5i
D. -3 + 5i

16.4. Writing a complex number in polar form is especially helpful for:

A. adding unlike terms
B. raising to powers and finding roots
C. graphing lines
D. solving systems by elimination

16.5. How many cube roots does a nonzero complex number have?

A. 1
B. 2
C. 3
D. 6

17. Compute (7 - 5i) - (2 + i). Answer in standard form.

17.1. The modulus of 6 + 8i is:

A. 10
B. 14
C. 48
D. 64

17.2. The argument of a complex number tells you its:

A. real part
B. imaginary part
C. angle from the positive real axis
D. modulus

17.3. The conjugate of -3 + 5i is:

A. 3 + 5i
B. -3 - 5i
C. 3 - 5i
D. -3 + 5i

17.4. Writing a complex number in polar form is especially helpful for:

A. adding unlike terms
B. raising to powers and finding roots
C. graphing lines
D. solving systems by elimination

17.5. How many cube roots does a nonzero complex number have?

A. 1
B. 2
C. 3
D. 6

18. Compute (1 + i)(1 - i). Answer with a number.

18.1. The modulus of 6 + 8i is:

A. 10
B. 14
C. 48
D. 64

18.2. The argument of a complex number tells you its:

A. real part
B. imaginary part
C. angle from the positive real axis
D. modulus

18.3. The conjugate of -3 + 5i is:

A. 3 + 5i
B. -3 - 5i
C. 3 - 5i
D. -3 + 5i

18.4. Writing a complex number in polar form is especially helpful for:

A. adding unlike terms
B. raising to powers and finding roots
C. graphing lines
D. solving systems by elimination

18.5. How many cube roots does a nonzero complex number have?

A. 1
B. 2
C. 3
D. 6

19. Find a principal argument for 1 + sqrt(3)i. Answer as an exact value.

19.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

19.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

19.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

19.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

19.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

20. Find a principal argument for -1 + sqrt(3)i. Answer as an exact value.

20.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

20.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

20.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

20.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

20.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

21. If z = 2(cos(pi / 6) + i sin(pi / 6)), find the modulus of z^2. Answer with a number.

21.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

21.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

21.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

21.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

21.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

22. If z = 3(cos(pi / 5) + i sin(pi / 5)), what is the argument of z^4? Answer as an exact value.

22.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

22.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

22.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

22.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

22.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

23. How many distinct fifth roots does 32 have in the complex plane? Answer with a number.

23.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

23.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

23.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

23.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

23.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

24. What is the modulus of any cube root of 8(cos(theta) + i sin(theta))? Answer with a number.

24.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

24.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

24.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

24.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

24.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

25. Write the conjugate of 5 - 2i. Answer as an equation.

25.1. The modulus of 6 + 8i is:

A. 10
B. 14
C. 48
D. 64

25.2. The argument of a complex number tells you its:

A. real part
B. imaginary part
C. angle from the positive real axis
D. modulus

25.3. The conjugate of -3 + 5i is:

A. 3 + 5i
B. -3 - 5i
C. 3 - 5i
D. -3 + 5i

25.4. Writing a complex number in polar form is especially helpful for:

A. adding unlike terms
B. raising to powers and finding roots
C. graphing lines
D. solving systems by elimination

25.5. How many cube roots does a nonzero complex number have?

A. 1
B. 2
C. 3
D. 6

26. Write the polar-form template for a complex number with modulus r and argument theta. Answer as an equation.

26.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

26.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

26.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

26.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

26.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

27. Write i^2. Answer as an equation.

27.1. The modulus of 6 + 8i is:

A. 10
B. 14
C. 48
D. 64

27.2. The argument of a complex number tells you its:

A. real part
B. imaginary part
C. angle from the positive real axis
D. modulus

27.3. The conjugate of -3 + 5i is:

A. 3 + 5i
B. -3 - 5i
C. 3 - 5i
D. -3 + 5i

27.4. Writing a complex number in polar form is especially helpful for:

A. adding unlike terms
B. raising to powers and finding roots
C. graphing lines
D. solving systems by elimination

27.5. How many cube roots does a nonzero complex number have?

A. 1
B. 2
C. 3
D. 6

28. Write i^4. Answer as an equation.

28.1. The modulus of 6 + 8i is:

A. 10
B. 14
C. 48
D. 64

28.2. The argument of a complex number tells you its:

A. real part
B. imaginary part
C. angle from the positive real axis
D. modulus

28.3. The conjugate of -3 + 5i is:

A. 3 + 5i
B. -3 - 5i
C. 3 - 5i
D. -3 + 5i

28.4. Writing a complex number in polar form is especially helpful for:

A. adding unlike terms
B. raising to powers and finding roots
C. graphing lines
D. solving systems by elimination

28.5. How many cube roots does a nonzero complex number have?

A. 1
B. 2
C. 3
D. 6

29. Write the product of z1 = r1 cis(theta1) and z2 = r2 cis(theta2). Answer as an equation.

29.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

29.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

29.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

29.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

29.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

30. Write the quotient z1 / z2 in polar form. Answer as an equation.

30.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

30.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

30.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

30.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

30.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

31. If z1 = r1 cis(theta1) and z2 = r2 cis(theta2), which product is correct?

A. r1 + r2 cis(theta1theta2)
B. r1r2 cis(theta1 - theta2)
C. r1r2 cis(theta1 + theta2)
D. r1 / r2 cis(theta1 + theta2)

31.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

31.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

31.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

31.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

31.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts

32. If z1 = r1 cis(theta1) and z2 = r2 cis(theta2), which quotient is correct?

A. (r1 / r2) cis(theta1 - theta2)
B. (r1r2) cis(theta1 + theta2)
C. (r1 + r2) cis(theta1 - theta2)
D. (r1 / r2) cis(theta1 + theta2)

32.1. The modulus of 3 + 4i is:

A. 4
B. 5
C. 7
D. 25

32.2. The argument of a complex number is its:

A. distance
B. angle
C. real part
D. conjugate

32.3. Polar form of a complex number uses:

A. slope and intercept
B. modulus and argument
C. real and imaginary parts only
D. a factor and a zero

32.4. De Moivre's theorem is most helpful for:

A. adding complex numbers
B. raising polar-form complex numbers to powers
C. factoring trinomials
D. finding asymptotes

32.5. Nth roots of a complex number come from splitting:

A. the real part only
B. the argument into equally spaced angles
C. the conjugate pair
D. the intercepts