PRACTICE & PROBLEM SOLVING

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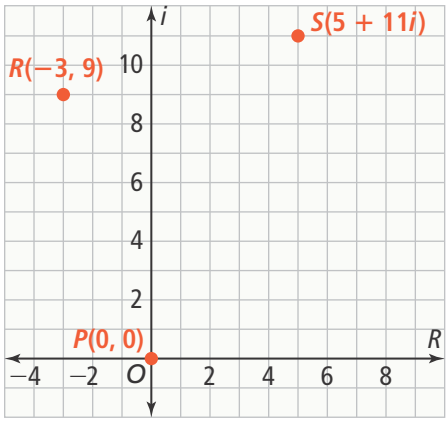
Practice Tutorial

Additional Exercises Available Online

UNDERSTAND

12. Construct Arguments LaTanya needed to find the fourth point in the parallelogram shown. She found the slope of $\overline{RP}$ to be -3 and used that slope to find that the missing point, T, is at (6, 8). Is LaTanya correct? Explain your reasoning.



13. Error Analysis Describe and correct the error a student made in finding the midpoint of the segment joining $5 + 8i$ and $4 - 4i$.

$$\text{midpoint} = \frac{(5 + 8i) + (4 - 4i)}{2}$$

$$\text{midpoint} = \frac{(5 + 4) + (8 - 4)i}{2}$$

$$\text{midpoint} = \frac{9 + 4i}{2}$$

$$\text{midpoint} = \frac{13i}{2} = 6.5i$$

✗

14. Construct Arguments Show that finding the modulus of a complex number $a + bi$ gives you the same result as using the Distance Formula to find the distance between (a, b) and the origin.

15. Generalize Is the modulus of a complex number the same as the modulus of its complex conjugate? Explain.

16. Higher Order Thinking When using a parallelogram to represent a subtraction of two complex numbers, you plot the opposite of the subtrahend. Why?

PRACTICE

Graph the complex number and its conjugate.
SEE EXAMPLE 1

17. $9 + i$

18. $-3 + 2i$

Find the midpoint of the segment that joins the points corresponding to the complex numbers. SEE EXAMPLE 2

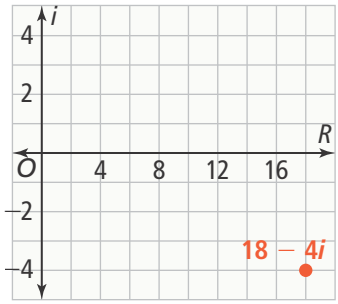
19. $-4 + 2i$ and $2 + (-8i)$

20. $1 + i$ and $3 - 5i$

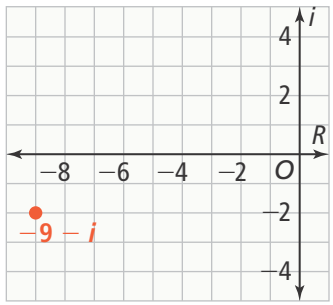
21. $-12 + 6i$ and $-5 - 5i$

Find the modulus of each complex number.
SEE EXAMPLE 3

22.



23.



Use a parallelogram to represent each operation.
SEE EXAMPLE 4

24. Add $11 + 6i$ and $7 - 4i$.

25. Add $7 + 5i$ and $4 - 3i$.

26. Subtract $-8 + 3i$ from $15 + i$.

27. Subtract $3 - 9i$ from $10 - 7i$.

Find the distance between the points representing the complex numbers. SEE EXAMPLE 5

28. $r = 4 + 6i$, $s = 7 - 10i$

29. $r = -12 + 2i$, $s = -2 + i$

30. $r = -5 - 7i$, $s = 1 + 4i$

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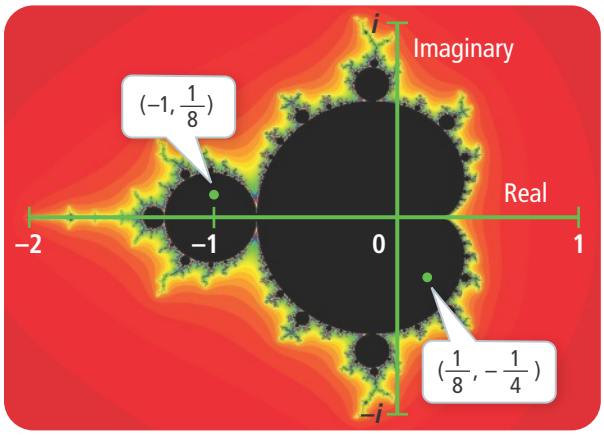
Mixed Review Available Online

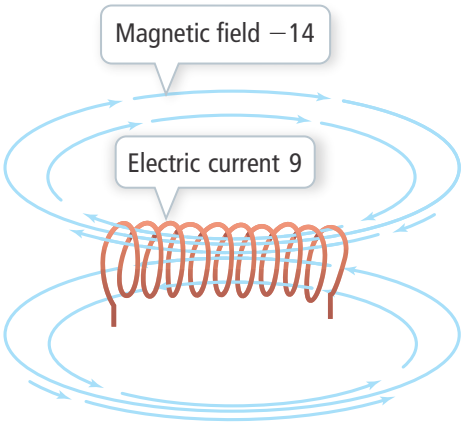
APPLY

31. Make Sense and Persevere Start with a complex number c. Square it and add c to get a new complex number. Then square that and add c again. Keep going. If, for your number c, your results never get larger than 2, then c is part of a collection of points called the Mandelbrot set. $-1 + \frac{1}{8}i$ and $\frac{1}{8} - \frac{1}{4}i$ are both in the Mandelbrot set. What is the distance between them?



32. Reason Alternating current (AC) circuits use complex numbers to represent impedance in ohms. To find the total impedance in a circuit, you need to find the sum of the impedances from each part of the circuit. A circuit has partial impedances of $4.2 + 3i$ and $5 - 2.2i$. What is the total impedance for the circuit?

33. Model With Mathematics A complex number is used to describe an electromagnetic field. The real and imaginary pieces represent the electric and magnetic components, respectively, that result from the motion of an electric charge or electric current. What ordered pair on the complex plane represents the electromagnetic field described below?



ASSESSMENT PRACTICE

34. Fill in the blanks to complete the statements about midpoints of segments.

I. The midpoint of the segment joining $-6 - 8i$ and $7 - 9i$ is _____.

II. The midpoint of the segment joining $-4i$ and _____ is $2 + 5i$.

III. The midpoint of the segment joining _____ and $-3 + 3i$ is $-7 + 5.5i$.

35. SAT/ACT What is the modulus of the complex number $1 + 8i$?

Ⓐ $\sqrt{63}$
Ⓑ 8
Ⓒ $\sqrt{65}$
Ⓓ $\sqrt{66}$
Ⓔ 9

36. Performance Task Deon is practicing with coordinates in the complex plane by determining the coordinates needed to draw a capital "A." He wants the horizontal bar of his "A" to connect the midpoints of the sides. He has chosen the top point of the "A" to be represented by $6i$ and the bottom left point to be represented by $-4 + i$.

A

Part A What complex number represents the bottom right point of the "A"?

Part B What complex numbers represent the points where the horizontal bar connects the sides of the "A"?

Part C What are the lengths (in units) of the three segments that make up the "A"?