**1.6 Operations with Complex Numbers**

1. What is the complex conjugate of ?
2. Is every complex number an imaginary number? Explain.

**Solve the equation.**

|  |  |  |  |
| --- | --- | --- | --- |
| 3. |  | 4. |  |
| 5. |  | 6. |  |
| 7. |  | 8. |  |
| 9. |  | 10. |  |
| 11. |  |  |  |
|  |  |  |  |
|  |  |  |  |

**Write the expression as a complex number in standard form.**

|  |  |  |  |
| --- | --- | --- | --- |
| 12. |  | 13. |  |
| 14. |  | 15. |  |
| 16. |  | 17. |  |
| 18. |  | 19. |  |
| 20. |  | 21. |  |

**Write the expression as a complex number in standard form.**

|  |  |  |  |
| --- | --- | --- | --- |
| 22. |  | 23. |  |
| 24. |  | 25. |  |
| 26. |  | 27. |  |
| 28. |  | 29. |  |
| 30. |  | 31. |  |
| 32. |  | 33. |  |

**Plot the numbers in the same complex plane.**

|  |  |  |  |
| --- | --- | --- | --- |
| 34. |  | 35. |  |
| 36. |  | 37. |  |
| 38. |  | 39. |  |
| 40. |  | 41. |  |

**Find the absolute value of the complex number.**

|  |  |  |  |
| --- | --- | --- | --- |
| 42. |  | 43. |  |
| 44. |  | 45. |  |
| 46. |  | 47. |  |
| 48. |  | 49. |  |
| 50. |  |  |  |

**Write the expression as a complex number in standard form.**

|  |  |  |  |
| --- | --- | --- | --- |
| 51. |  | 52. |  |
| 53. |  | 54. |  |
| 55. |  | 56. |  |

**In problems 57 & 58, describe and correct the error in solving the equation.**

1.  ✗

1. ✗

1. The additive inverse of a complex number z is a complex number  such that . The multiplicative inverse of  is a complex number  such that . Find the additive and multiplicative inverses of each complex number.
2. 
3. 
4. 
5. Find two imaginary numbers whose sum is a real number. How are the imaginary numbers related?

**CHALLENGE: Write the expression as a complex number in standard form.**

|  |  |  |  |
| --- | --- | --- | --- |
| 61. |  | 62. |  |
| 63. |  | 64. |  |

**CIRCUITS: In exercises 65-67, each component of a circuit has been labeled with its resistance or reactance. Find the impedance of the circuit.**

|  |  |  |  |
| --- | --- | --- | --- |
| 65. |  | 66. |  |
| 67. |  |  |  |

1. The graph shows how you can geometrically add two complex numbers (in this case,  and) to find their sum (in this case, ). Find each of the following sums by drawing their graph.
2. 
3. 
4. 
5. 
6. Make a table that shows the powers of *i* from  to  in the first row and the simplified forms of these powers in the second row. *Describe* the pattern you observe in the table. Verify that the pattern continue for the next four powers of *i*.

**In exercises 70-73, use the given numbers to verify that the given property extends to the complex numbers. Refer to the example.**

EXAMPLE: Extend real number properties

The associative property for addition for real numbers can be extended to the complex numbers. Verify this for the numbers , , and 

**Solution:**

The associative property of addition for real numbers states that for real numbers a, b, and c, .

 

Because the sums are equal, the property is verified for the given numbers.

1. , ; Commutative property of multiplication
2. , , ; Associative property of multiplication
3. , , ; Distributive property
4. , ; Commutative property of addition