

Complex Numbers

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Questions

1) Express in terms of i :

a. $\sqrt{-1} =$

b. $\sqrt{-4} =$

c. $\sqrt{-25} =$

d. $\sqrt{-3} =$

e. $\sqrt{-5} =$

2) Compute:

a. i^1

b. i^2

c. i^3

d. i^4

e. i^5

f. i^{17}

3) Write the values of a and b for the following complex numbers:

a. $2+5i$

b. $3-i$

c. $\frac{\sqrt{3}}{2} - \frac{1}{2}i$

d. $7i$

e. -4

f. 0

4) Solve the following quadratic equations:

a. $x^2 = -1$

b. $x^2 + 36 = 0$

c. $x^2 - 2x + 5 = 0$

5) Solve the following quadratic equation: $x^2 + x + 1 = 0$.

6) Solve the following quadratic equation: $z^2 + iz + 6 = 0$.

7) Given two complex numbers: $z_1 = 2 + 3i$, $z_2 = 5 - 2i$.

Compute the value of the following expressions:

a. $z_1 + z_2$

b. $z_1 - z_2$

c. $z_1 \cdot z_2$

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8) Write the complex conjugate of the following complex numbers:

a. $2+5i$

b. $3-i$

c. $\frac{\sqrt{3}}{2}-\frac{1}{2}i$

d. $7i$

e. -4

f. 0

9) Compute:

a. $\frac{11+2i}{2-i}$

b. $\frac{3+7i}{2-5i}$

c. $\frac{19-9i}{2-3i}$

10) Solve the following equation: $3z-11=iz-7i$.

11) Solve the following equation: $iz+5=4i$.

12) Solve the following system of equations in two complex unknowns, z and w :

$$\begin{cases} 3z+iw=5-4i \\ 5iz-2w=5+8i \end{cases}$$

13) Solve the following equations, in which a and b are real:

a. $2a-3i=10+bi$

b. $3a-8+5bi=2b-ai-3i$

14) Solve the following equation: $2z+7i=iz+\bar{z}-3$.

15) Compute the following square roots:

a. $\sqrt{5-12i}$

b. $\sqrt{8+6i}$

16) Solve the following equation: $z^2-2(1-2i)z-8i=0$.

17) Solve the following equation: $iz^2-2(1-i)z+6+15i=0$.

18) Solve the following equation: $z^2-i\bar{z}+6=0$.

Answer Key

- 1) a. i b. $2i$ c. $5i$ d. $\sqrt{3}i$ e. $\sqrt{5}i$
- 2) a. i b. -1 c. $-i$ d. 1 e. i f. i
- 3) a. $a=2, b=5$ b. $a=3, b=-1$ c. $a=\frac{\sqrt{3}}{2}, b=-\frac{1}{2}$
d. $a=0, b=7$ e. $a=-4, b=0$ f. $a=0, b=0$
- 4) a. $x=\pm i$ b. $x=\pm 6i$ c. $x=1\pm 2i$
- 5) $x=z=-\frac{1}{2}\pm\frac{\sqrt{3}}{2}i$
- 6) $z_1=2i, z_2=-3i$
- 7) a. $7+i$ b. $-3+5i$ c. $16+11i$
- 8) a. $2-5i$ b. $3+i$ c. $\frac{\sqrt{3}}{2}+\frac{1}{2}i$ d. $-7i$ e. -4 f. 0
- 9) a. $4+3i$ b. $-1+i$ c. $5+3i$
- 10) $4-i$
- 11) $-4+5i$
- 12) $z=2-3i, w=5+i$
- 13) a. $a=5, b=-3$ b. $a=2, b=-1$
- 14) $z=-\frac{1}{2}-\frac{5}{2}i$
- 15) a. $\pm(3-2i)$ b. $\pm(3+i)$
- 16) $2, -4i$
- 17) $3i, -2-5i$
- 18) $2i, -3i$