

### Комплексные числа

Задание 1. Представить в тригонометрической и показательной формах. Варианты:

- |   |   |   |  |
|---|---|---|--|
| 1. $-\frac{1}{2} + i\frac{\sqrt{3}}{2}$         | 2. $-\frac{1}{2} - i\frac{\sqrt{3}}{2}$                     | 3. $2 + 3i$   | 4. $-1$  |
| 5. $+i$   | 6. $1 - i$  | 7. $\frac{\sqrt{2}}{2} + i\frac{\sqrt{2}}{2}$               | 8. $-\frac{\sqrt{2}}{2} + i\frac{\sqrt{2}}{2}$ |
| 9. $-1 + i$                                     | 10. $1$   | 11. $-i$  | 12. $1 + i$                                    |
| 13. $-\frac{\sqrt{2}}{2} - i\frac{\sqrt{2}}{2}$ | 14. $\frac{\sqrt{2}}{2} - i\frac{\sqrt{2}}{2}$              | 15. $-1 - i$  | 16. $-2 + 3i$                                  |
| 17. $\frac{\sqrt{3}}{2} + i\frac{1}{2}$         | 18. $\frac{\sqrt{3}}{2} - i\frac{1}{2}$                     | 19. $-2 - 3i$   | 20. $-\frac{\sqrt{3}}{2} + i\frac{1}{2}$       |
| 21. $-\frac{\sqrt{3}}{2} - i\frac{1}{2}$        | 22. $2 - 3i$  | 23. $4 - 3i$  | 24. $\frac{1}{2} + i\frac{\sqrt{3}}{2}$        |
| 25. $\frac{1}{2} - i\frac{\sqrt{3}}{2}$         | 26. $\frac{\sqrt{5}-1}{4} - i\frac{\sqrt{10+2\sqrt{5}}}{4}$ | 27. $\frac{\sqrt{5}-1}{4} + i\frac{\sqrt{10+2\sqrt{5}}}{4}$ |  |

Задание 2. Определить модули и аргументы комплексных чисел. Варианты:

- |   |   |   |
|---|---|---|
| 1. $i \sin \frac{23}{24} \pi$                         | 2. $5(\cos \frac{\pi}{10} - i \sin \frac{\pi}{10})$     | 3. $\sin \frac{\pi}{5} + i \cos \frac{\pi}{5}$        |
| 4. $-5(\cos \frac{\pi}{10} - i \sin \frac{\pi}{10})$  | 5. $5(\cos \frac{\pi}{10} + i \sin \frac{\pi}{10})$     | 6. $3(\cos \frac{\pi}{10} - i \sin \frac{\pi}{10})$   |
| 7. $\cos \frac{3}{4} \pi - i \sin \frac{3}{4} \pi$    | 8. $5(-\cos \frac{\pi}{10} - i \sin \frac{\pi}{10})$    | 9. $-\sin \frac{\pi}{5} + i \cos \frac{\pi}{5}$       |
| 10. $-5(\cos \frac{\pi}{10} - i \sin \frac{\pi}{10})$ | 11. $\cos \frac{3}{4} \pi + i \sin \frac{3}{4} \pi$     | 12. $-3(\sin \frac{\pi}{10} - i \cos \frac{\pi}{10})$ |
| 13. $\sin \frac{3}{4} \pi + i \cos \frac{3}{4} \pi$   | 14. $-3(\cos \frac{\pi}{10} + i \sin \frac{\pi}{10})$   | 15. $\sin \frac{\pi}{5} + i \cos \frac{\pi}{5}$       |
| 16. $-4(\cos \frac{\pi}{10} - i \sin \frac{\pi}{10})$ | 17. $-\cos \frac{3}{4} \pi - i \sin \frac{3}{4} \pi$    | 18. $-4(\sin \frac{\pi}{10} + i \cos \frac{\pi}{10})$ |
| 19. $-\sin \frac{3}{4} \pi + i \cos \frac{3}{4} \pi$  | 20. $4(\cos \frac{\pi}{10} - i \sin \frac{\pi}{10})$    | 21. $\sin \frac{\pi}{5} + i \cos \frac{\pi}{5}$       |
| 22. $-(\cos \frac{\pi}{10} - i \sin \frac{\pi}{10})$  | 23. $-\cos \frac{3}{4} \pi + i \sin \frac{3}{4} \pi$    | 24. $-(\sin \frac{\pi}{10} + i \cos \frac{\pi}{10})$  |
| 25. $-\sin \frac{3}{4} \pi - i \cos \frac{3}{4} \pi$  | 26. $3 \cos \frac{3}{4} \pi + i 3 \sin \frac{3}{4} \pi$ | 27. $-3(\sin \frac{\pi}{10} + i \cos \frac{\pi}{10})$ |

Задание 3. Вычислить выражения. Варианты:

- |                                 |   |   |
|---------------------------------|---|---|
| 1. $\frac{-5+3i}{3+5i}$         | 2. $\frac{17i}{2+7i}$   | 3. $\frac{1+i}{1-i} + \frac{1-i}{1+i}$  |
| 4. $(\frac{1+i\sqrt{3}}{2})^3$  | 5. $(\frac{1+i\sqrt{3}}{2})^{60} - (\frac{1-i\sqrt{3}}{2})^{60}$  |   |
| 6. $\sqrt[3]{-i}$               | 7. $\sqrt[3]{2+2i}$   | 8. $\sqrt[4]{i}$                        |
| 9. $\sqrt{i}$                   |   |   |
| 10. $\frac{5+3i}{3+5i}$         | 11. $\frac{17i}{2-7i}$  | 12. $\frac{1-i}{1+i} - \frac{1+i}{1-i}$ |
| 13. $(\frac{1-i\sqrt{3}}{2})^3$ | 14. $(\frac{1+i\sqrt{3}}{2})^{12} - (\frac{1-i\sqrt{3}}{2})^{12}$ |   |
| 15. $\sqrt[3]{i}$               | 16. $\sqrt[3]{2-2i}$  | 17. $\sqrt[4]{-i}$                      |
| 18. $\sqrt{9i}$                 |   |   |
| 19. $\sqrt[5]{-i}$              | 20. $\sqrt[3]{-2+2i}$   | 21. $\sqrt[4]{-1}$                      |
| 22. $\sqrt{-16i}$               |   |   |

$$23. \frac{-5+3i}{3-5i} \quad 24. \frac{17i}{2+7i} \quad 25. \frac{1+i}{1-i} - \frac{1-i}{1+i}$$

$$26. \left(\frac{-1+i\sqrt{3}}{2}\right)^3 \quad 27. \left(\frac{1-i\sqrt{3}}{2}\right)^{24} - \left(\frac{1+i\sqrt{3}}{2}\right)^{24}$$

**Задание 4.** Решить уравнение или неравенство. Варианты:

$$1. |x-1+i \cdot (y+2)| < 1 \quad 2. |z-1| \geq 2 \quad 3. |z+i| \leq 1$$

$$4. z^2 + 2z + 2 = 0 \quad 5. z^2 - z = -1 \quad 6. z^4 + z^2 + 1 = 0$$

$$7. z \cdot \bar{z} + z + \bar{z} - 3 \leq 0 \quad 8. |z|^2 - |z| > -\frac{1}{4} \quad 9. z^3 + 8i = 0$$

$$10. |x-i \cdot y| < 1 \quad 11. 5 \geq |z-1| \geq 2 \quad 12. |z-3i| \leq 1$$

$$13. z^2 - 2z + 2 = 0 \quad 14. z^2 + z = -1 \quad 15. z^4 - z^2 + 1 = 0$$

$$16. |z|^2 - 2|z| + \frac{3}{4} \leq 0 \quad 17. z \cdot \bar{z} + z + \bar{z} > -1 \quad 18. z^3 + 27i = 0$$

$$19. |x+i \cdot y+1| < 1 \quad 20. |z-2 \cdot i| \geq 2 \quad 21. |-z+i| \leq 1$$

$$22. z^2 - 3z + 3 = 0 \quad 23. z^2 + 2z = -3 \quad 24. z^4 - 3z^2 + 3 = 0$$

$$25. |z|^2 - 2|z| - 3 \leq 0 \quad 26. z \cdot \bar{z} - z - \bar{z} \leq -\frac{3}{4} \quad 27. z^3 - 8i = 0$$

**Задание 5.** Найти все значения корня. Варианты:

1. $\sqrt[4]{-1}$ .	2. $\sqrt[4]{\frac{-1+i\sqrt{3}}{2}}$ .	3. $\sqrt[3]{1}$ .
4. $\sqrt[3]{i}$ .	5. $\sqrt[4]{1}$ .	6. $\sqrt[4]{\frac{-1-i\sqrt{3}}{2}}$ .
7. $\sqrt[3]{-1}$ .	8. $\sqrt[3]{-i}$ .	9. $\sqrt[4]{-16}$ .
10. $\sqrt[4]{\frac{1+i\sqrt{3}}{32}}$ .	11. $\sqrt[3]{8}$ .	12. $\sqrt[3]{8i}$ .
13. $\sqrt[4]{16}$ .	14. $\sqrt[4]{\frac{-1-i\sqrt{3}}{32}}$ .	15. $\sqrt[3]{-8}$ .
16. $\sqrt[3]{-8i}$ .	17. $\sqrt[4]{-1/16}$ .	18. $\sqrt[4]{-8+i8\sqrt{3}}$ .
19. $\sqrt[3]{1/8}$ .	20. $\sqrt[3]{i/8}$ .	21. $\sqrt[4]{1/16}$ .
22. $\sqrt[4]{-8-i8\sqrt{3}}$ .	23. $\sqrt[3]{-1/8}$ .	24. $\sqrt[3]{-i/8}$ .
25. $\sqrt[4]{-128+i128\sqrt{3}}$ .	26. $\sqrt[3]{27}$ .	27. $\sqrt[4]{1/256}$ .
28. $\sqrt[4]{-128-i128\sqrt{3}}$ .	29. $\sqrt[3]{i/27}$ .	30. $\sqrt[4]{256}$ .