

Liczby zespolone – Odpowiedzi

Zad.1. (obl.)

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| (1) $1 + 17i; 1; 17; 1 - 17i; \sqrt{290}$ | (12) $-\frac{11}{25} + \frac{2}{25}i; -\frac{11}{25}; \frac{2}{25}; -\frac{11}{25} - \frac{2}{25}i; \frac{\sqrt{5}}{5}$ |
| (2) $-11 + 7i; -11; 7; -11 - 7i; \sqrt{170}$ | (13) $2 + i; 2; 1; 2 - i; \sqrt{5}$ |
| (3) $8i; 0; 8; -8i; 8$ | (14) $1 - i; 1; -1; 1 + i; \sqrt{2}$ |
| (4) $-1 - i; -1; -1; -1 + i; \sqrt{2}$ | (15) $-11 - 5i; -11; -5; -11 + 5i; \sqrt{145}$ |
| (5) $\frac{2}{25} - \frac{11}{25}i; \frac{2}{25}; -\frac{11}{25}; \frac{2}{25} + \frac{11}{25}i; \frac{\sqrt{5}}{5}$ | (16) $\frac{5}{2}i; 0; \frac{5}{2}; -\frac{5}{2}i; \frac{5}{2}$ |
| (6) $\frac{1}{17} + \frac{13}{17}i; \frac{1}{17}; \frac{13}{17}; \frac{1}{17} - \frac{13}{17}i; \frac{\sqrt{170}}{17}$ | (17) $-\frac{6}{13}; -\frac{6}{13}; 0; \frac{6}{13}$ |
| (7) $-\frac{19}{10} + \frac{17}{10}i; -\frac{19}{10}; \frac{17}{10}; -\frac{19}{10} - \frac{17}{10}i; \frac{\sqrt{170}}{10}$ | (18) $-\frac{8}{5} - \frac{4}{5}i; -\frac{8}{5}; -\frac{4}{5}; -\frac{8}{5} + \frac{4}{5}i; \frac{4\sqrt{5}}{5}$ |
| (8) $-\frac{7}{5} - \frac{4}{5}i; -\frac{7}{5}; \frac{4}{5}; -\frac{7}{5} + \frac{4}{5}i; \frac{\sqrt{65}}{5}$ | (19) $-2 - i; -2; -1; -2 + i; \sqrt{5}$ |
| (9) $\frac{5}{2} + \frac{3}{2}i; \frac{5}{2}; \frac{3}{2}; \frac{5}{2} - \frac{3}{2}i; \frac{\sqrt{34}}{2}$ | (20) $-6 - 14i; -6; -14; -6 + 14i; 2\sqrt{58}$ |
| (10) $-\frac{2}{5} + \frac{9}{5}i; -\frac{2}{5}; \frac{9}{5}; -\frac{2}{5} - \frac{9}{5}i; \frac{\sqrt{85}}{5}$ | (21) $-\frac{18}{5} - \frac{27}{10}i; -\frac{18}{5}; -\frac{27}{10}; -\frac{18}{5} + \frac{27}{10}i; \frac{9}{2}$ |
| (11) $-\frac{20}{13} - \frac{9}{13}i; -\frac{20}{13}; -\frac{9}{13}; -\frac{20}{13} + \frac{9}{13}i; \frac{\sqrt{482}}{13}$ | (22) $3 - 2i; 3; -2; 3 + 2i; \sqrt{13}$ |

Zad.2. (obl.)

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| (1) $-6\frac{1}{2}$ | (3) $1\frac{5}{26}$ | (5) -22 |
| (2) $-\frac{1}{2}$ | (4) $\frac{23}{14}$ | |

Zad.3. (równ. rzecz.)

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|---------------------|---------------------|
| (1) $x = 1, y = -2$ | (3) $x = 3, y = -2$ |
| (2) $x = 2, y = -1$ | (4) $x = -1, y = 6$ |

Zad.4. (równ.)

(1) $0, 2, -1 + \sqrt{3}i, -1 - \sqrt{3}i$

(2) $0, 2 - 2i$

(3) $1, 2$

(4) $-\frac{3}{10} + \frac{3}{5}i$

(5) $2 + \frac{1}{3}i$

(6) $-2i, 1 + i$

Zad.5. (post.tryg.)

(1) $\cos \frac{\pi}{2} + i \sin \frac{\pi}{2}$ (4) $\sqrt{2}(\cos \frac{3\pi}{4} + i \sin \frac{3\pi}{4})$ (8) $2(\cos \frac{5\pi}{3} + i \sin \frac{5\pi}{3})$

(2) $2(\cos \frac{3\pi}{2} + i \sin \frac{3\pi}{2})$ (5) $\sqrt{2}(\cos \frac{5\pi}{4} + i \sin \frac{5\pi}{4})$ (9) $2(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3})$

(3) $\sqrt{2}(\cos \frac{\pi}{4} + i \sin \frac{\pi}{4})$ (6) $2(\cos \frac{\pi}{6} + i \sin \frac{\pi}{6})$ (10) $4(\cos \frac{7\pi}{6} + i \sin \frac{7\pi}{6})$

Zad.6. (potęgowanie)

(1) $-\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i$ (6) $-\frac{1}{2} + \frac{\sqrt{3}}{2}i$ (11) $16(1 - \sqrt{3} - i - \sqrt{3}i)$

(2) $-i$ (7) $6^3(-3 - 3\sqrt{3}i)$ (12) $\frac{\sqrt{6} + \sqrt{2} + (\sqrt{6} - \sqrt{2})i}{4}$

(3) -64 (8) $2^9(1 - \sqrt{3}i)$ (13) $-1 + i$

(4) $-\frac{1}{4}$ (9) $-64 + 64\sqrt{3}i$ (14) $16\sqrt{2} - 16\sqrt{2}i$

(5) -64 (10) $-\frac{1}{2}i$

Zad.7. * (mod. i arg.)

(1) $1, \phi$ (3) $1, \pi + \phi$ (5) $1, 2\phi$

(2) $1, \pi - \phi$ (4) $1, \frac{3\pi}{2} - \phi$ (6) $1, -2n\phi$

Zad.8. * (f.tryg.)

(1) $3 \cos^2 \alpha \sin \alpha - \sin^3 \alpha$ (2) $1 - 8 \cos^2 \alpha \sin^2 \alpha$

Zad.9. (pierw.)

(1) $\frac{3}{2} + \frac{3\sqrt{3}}{2}i, -3, \frac{3}{2} - \frac{3\sqrt{3}}{2}i$

(2) $2\sqrt{2}, -2\sqrt{2}$

- (3) $\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i, -\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i, -\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i, \frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i$
- (4) $\frac{\sqrt{3}}{2} + \frac{1}{2}i, i, -\frac{\sqrt{3}}{2} + \frac{1}{2}i, -\frac{\sqrt{3}}{2} - \frac{1}{2}i, -i, \frac{\sqrt{3}}{2}i - \frac{1}{2}i$
- (5) $\sqrt[6]{2}(\cos \frac{\pi}{12} + i \sin \frac{\pi}{12}), \sqrt[6]{2}(-\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i), \sqrt[6]{2}(\cos \frac{17\pi}{12} + i \sin \frac{17\pi}{12})$
- (6) $\sqrt{3} + i, -\sqrt{3} + i, -2i$
- (7) $-1 + i, 1 - i$
- (8) $\sqrt{2}(\cos \frac{3\pi}{8} + i \sin \frac{3\pi}{8}), \sqrt{2}(\cos \frac{7\pi}{8} + i \sin \frac{7\pi}{8}), \sqrt{2}(\cos \frac{11\pi}{8} + i \sin \frac{11\pi}{8}), \sqrt{2}(\cos \frac{15\pi}{8} + i \sin \frac{15\pi}{8})$
- (9) $\sqrt[3]{2}(\cos \frac{11\pi}{18} + i \sin \frac{11\pi}{18}), \sqrt[3]{2}(\cos \frac{23\pi}{18} + i \sin \frac{23\pi}{18}), \sqrt[3]{2}(\cos \frac{35\pi}{18} + i \sin \frac{35\pi}{18})$
- (10) $\frac{\sqrt{6}}{2} - \frac{\sqrt{2}}{2}i, -\frac{\sqrt{6}}{2} + \frac{\sqrt{2}}{2}i$
- (11) $\sqrt[4]{2}(\cos \frac{23\pi}{24} - i \sin \frac{23\pi}{24}), \sqrt[4]{2}(\cos \frac{47\pi}{24} + i \sin \frac{47\pi}{24})$
- (12) $\sqrt[6]{2}(\cos \frac{\pi}{36} + i \sin \frac{\pi}{36}), \sqrt[6]{2}(\cos \frac{25\pi}{36} + i \sin \frac{25\pi}{36}), \sqrt[6]{2}(\cos \frac{49\pi}{36} + i \sin \frac{49\pi}{36})$
- (13) $\sqrt[3]{2}(\cos \frac{\pi}{18} + i \sin \frac{\pi}{18}), \sqrt[3]{2}(\cos \frac{13\pi}{18} + i \sin \frac{13\pi}{18}), \sqrt[3]{2}(\cos \frac{25\pi}{18} + i \sin \frac{25\pi}{18})$
- (14) $1, -1, i, -i, \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i, \frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i, -\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i, -\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i$
- (15) $\frac{\sqrt{3}}{2} + \frac{1}{2}i, -\frac{\sqrt{3}}{2} + \frac{1}{2}i, -\frac{\sqrt{3}}{2} - \frac{1}{2}i, \frac{\sqrt{3}}{2} - \frac{1}{2}i, i, -i$

Zad.10. (równ.)

- (1) $2 + 2i, 2 - 2i$
- (2) $-3 + \sqrt{2}i, -3 - \sqrt{2}i$
- (3) $\frac{1+\sqrt{3}i}{3}, \frac{1-\sqrt{3}i}{3}$
- (4) $\frac{-1+\sqrt{3}i}{2}, \frac{-1-\sqrt{3}i}{2}$
- (5) $-\frac{1}{2} - \frac{\sqrt{19}}{2}i, -\frac{1}{2} + \frac{\sqrt{19}}{2}i$
- (6) $\frac{\sqrt{5}-1}{2} - \frac{\sqrt{5}+1}{2}i, -\frac{\sqrt{5}+1}{2} + \frac{\sqrt{5}-1}{2}i$
- (7) $i, 2 + 3i$
- (8) $2 + 2i, 0$
- (9) $\sqrt{3} - 1 - (\sqrt{3} + 1)i, -\sqrt{3} + 1 + (\sqrt{3} + 1)i$
- (10) $2\sqrt{3} + 1 + (\sqrt{3} - 2)i, -2 + 4i, 1 - 2\sqrt{3} - (\sqrt{3} + 2)i$
- (11) $0, \frac{\sqrt{3}+i}{2}, \frac{-\sqrt{3}+i}{2}, -i$
- (12) $0, i, \frac{-\sqrt{3}-i}{2}, \frac{\sqrt{3}-i}{2}$

$$(13) \quad 0, i, -\frac{\sqrt{3}}{2} - \frac{1}{2}i, \frac{\sqrt{3}}{2} - \frac{1}{2}i$$

$$(14) \quad i, \frac{-\sqrt{3}-i}{2}, \frac{\sqrt{3}-i}{2}, 1, -1, -i$$

$$(15) \quad \frac{\sqrt{2}+2}{2} - \frac{\sqrt{2}}{2}i, \frac{2-\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i$$

$$(16) \quad \frac{\sqrt[3]{4}}{2} + \frac{\sqrt[3]{4}}{2}i, \frac{\sqrt[3]{4}}{2} - \frac{\sqrt[3]{4}}{2}i, \sqrt[6]{2}(\cos \frac{11\pi}{12} + i \sin \frac{11\pi}{12}), \sqrt[6]{2}(\cos \frac{19\pi}{12} + i \sin \frac{19\pi}{12}), \sqrt[6]{2}(\cos \frac{13\pi}{12} + i \sin \frac{13\pi}{12}), \sqrt[6]{2}(\cos \frac{5\pi}{12} + i \sin \frac{5\pi}{12})$$

$$(17) \quad 1 - \sin \frac{2\pi}{9} + i \cos \frac{2\pi}{9}, 1 - \sin \frac{8\pi}{9} + i \cos \frac{8\pi}{9}, 1 - \sin \frac{14\pi}{9} + i \cos \frac{14\pi}{9}$$

$$(18) \quad 2 + i, -1 - \frac{\sqrt{3}}{2} + (\sqrt{3} - \frac{1}{2})i, -1\frac{\sqrt{3}}{2} + (-\frac{1}{2} - \sqrt{3})i$$

$$(19) \quad 3 - i, 3i + 1, -3 + i, -3i - 1$$

Zad.11. (rys.) –