

p.9. 1章§ 2. いろいろな数と式 BASIC

35. (1) 解答参照 (2) 与式 =  $\frac{(x-2)(x-3)}{(x-2)(x^2+2x+4)} = \frac{x-3}{x^2+2x+4}$ .
- (3) 与式 =  $\frac{y(x+y)(x-y)}{xy(x+y)} = \frac{x-y}{x}$ .
36. (1) 与式 =  $\frac{(x-y)^2}{(x+y)(x-y)} + \frac{2xy}{(x+y)(x-y)} = \frac{x^2-2xy+y^2}{(x+y)(x-y)} + \frac{2xy}{(x+y)(x-y)} = \frac{x^2+y^2}{(x+y)(x-y)}$ .
- (2) 与式 =  $\frac{(a+b)^2}{(a-b)(a+b)} - \frac{(a-b)^2}{(a+b)(a-b)} = \frac{a^2+2ab+b^2}{(a-b)(a+b)} - \frac{a^2-2ab+b^2}{(a+b)(a-b)} = \frac{4ab}{(a-b)(a+b)}$ .
- (3) 与式 =  $\frac{2a+1}{(2a-1)(2a+1)} + \frac{2a-1}{(2a+1)(2a-1)} - \frac{2}{(2a+1)(2a-1)} = \frac{4a-2}{(2a+1)(2a-1)} = \frac{2(a-1)}{(2a+1)(2a-1)}$   
 $= \frac{2}{2a+1}$ .
- (4) 与式 =  $\frac{4x^2y^2}{a^3b^3} \times \frac{a^2b^4}{-x^6y^3} = -\frac{4b}{ax^4y}$ .
- (5) 与式 =  $\frac{(x+y)(x-y)}{x^2y^2} \times \frac{x^3y^2}{(x+y)(x^2-xy+y^2)} = \frac{x(x-y)}{x^2-xy+y^2}$ .
- (6) 与式 =  $\frac{2x+3-1}{2x+3} \times \frac{1+2(x+1)}{x+1} = \frac{2x+2}{2x+3} \times \frac{2x+3}{x+1} = \frac{2(x+1)}{x+1} = 2$ .
37. (1) 与式 =  $\frac{\left(a - \frac{1}{a}\right) \times a}{\left(1 - \frac{1}{a}\right) \times a} = \frac{a^2-1}{a-1} = \frac{(a+1)(a-1)}{a-1} = a+1$ .
- (2) 与式 =  $\frac{\left(x+y - \frac{6y^2}{x}\right) \times x}{\left(1 - \frac{2y}{x}\right) \times x} = \frac{x^2+xy-6y^2}{x-2y} = \frac{(x+3y)(x-2y)}{x-2y} = x+3y$ .
38.  $(x^2-2x-2) \div (x-3)$  を筆算 (または組立除法) で計算すると商は  $x+1$ , 余りは 1. よって除法の等式より  
 $x^2-2x-2 = (x-3)(x+1)+1$ . よって  $\frac{x^2-2x-2}{x-3} = \frac{(x-3)(x+1)+1}{x-3} = \frac{(x-3)(x+1)}{x-3} + \frac{1}{x-3} = x+1 + \frac{1}{x-3}$ .  
 同様に  $(x^2+3x+3) \div (x+2)$  を筆算 (または組立除法) で計算すると商は  $x+1$ , 余りは 1. よって除法の等式より  
 $x^2+3x+3 = (x+2)(x+1)+1$ . よって  $\frac{x^2+3x+3}{x+2} = \frac{(x+2)(x+1)+1}{x+2} = \frac{(x+2)(x+1)}{x+2} + \frac{1}{x+2} = x+1 + \frac{1}{x+2}$ .  
 以上により与式 =  $\left(x+1 + \frac{1}{x-3}\right) - \left(x+1 + \frac{1}{x+2}\right) = \frac{1}{x-3} - \frac{1}{x+2} = \frac{x+2-(x-3)}{(x-3)(x+2)} = \frac{5}{(x-3)(x+2)}$ .
39. (1)  $|0+1| + |0-4| = |1| + |-4| = 1+4=5$ . (2)  $|-2+1| + |-2-4| = |-1| + |-6| = 1+6=7$ .
- (3)  $|-3+1| + |-3-4| = |-2| + |-7| = 2+7=9$ . (4)  $|\pi+1| + |\pi-4| = (\pi+1) + \{-(\pi-4)\} = 5$ .
- 注: (4) で  $\pi+1 > 0, \pi-4 < 0$  だから  $|\pi+1| = \pi+1, |\pi-4| = -(\pi-4)$ .
40. (1) 与式 =  $\sqrt{5} + 2\sqrt{5} = 3\sqrt{5}$ . (2) 与式 =  $2\sqrt{3} + 3\sqrt{3} - 4\sqrt{3} = \sqrt{3}$ .
- (3) 与式 =  $\frac{4\sqrt{2}}{10\sqrt{2}} = \frac{2}{5}$ . (4) 与式 =  $(\sqrt{3})^2 - 2\sqrt{3} \cdot \frac{1}{\sqrt{3}} + \left(\frac{1}{\sqrt{3}}\right)^2 = 3 - 2 + \frac{1}{3} = \frac{4}{3}$ .
41. (1)  $3 - \sqrt{5} > 0$  より与式 =  $|3 - \sqrt{5}| = 3 - \sqrt{5}$ .
- (2)  $1 - \sqrt{3} < 0$  より与式 =  $|1 - \sqrt{3}| = -(1 - \sqrt{3}) = \sqrt{3} - 1$ .
42. (1) 与式 =  $\frac{\sqrt{3}-1}{(\sqrt{3}+1)(\sqrt{3}-1)} = \frac{\sqrt{3}-1}{3-1} = \frac{\sqrt{3}-1}{2}$ .
- (2) 与式 =  $\frac{(\sqrt{3}+\sqrt{2})^2}{(\sqrt{3}-\sqrt{2})(\sqrt{3}+\sqrt{2})} = \frac{3+2\sqrt{6}+2}{3-2} = 5+2\sqrt{6}$ .
43. (1) 与式 =  $5-i$ . (2) 与式 =  $2+3i$ .
- (3) 与式 =  $6+10i+3i+5i^2 = 1+13i$ . (4) 与式 =  $3i-12-2i^2+8i = -10+11i$ .
- (5) 与式 =  $\frac{(1-i)^2}{(1+i)(1-i)} = \frac{1-2i+i^2}{1-i^2} = -i$ . (6) 与式 =  $\frac{i}{2i^2} \times (1+2i+i^2) = -\frac{i}{2} \times 2i = 1$ .

44. (1) 与式 =  $\sqrt{8i} \times \sqrt{2i} = \sqrt{16i^2} = -4$ .

(2) 与式 =  $\sqrt{3i} \times \sqrt{6} = \sqrt{18i} = 3\sqrt{2i}$ .

(3) 与式 =  $\sqrt{5} \times \sqrt{5i} = \sqrt{25i} = 5i$ .

(4) 与式 =  $\frac{\sqrt{8i}}{\sqrt{2i}} = \sqrt{4} = 2$ .

(5) 与式 =  $\frac{2\sqrt{3}}{\sqrt{3i}} = \frac{2}{i} = \frac{2i}{i^2} = -2i$ .

(6) 与式 =  $\frac{\sqrt{15i}}{\sqrt{5}} = \frac{\sqrt{75i}}{5} = \frac{5\sqrt{3i}}{5} = \sqrt{3i}$ .

45. 解答参照

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47. (1) 与式 =  $4 + 3i + 4 - 3i = 8$ .

(2) 与式 =  $(-3 + 2i)(-3 - 2i) = 9 - 4i^2 = 9 + 4 = 13$ .

48. (1)  $|1 + i| = \sqrt{1^2 + 1^2} = \sqrt{2}$ .

(2)  $|1 - i| = \sqrt{1^2 + (-1)^2} = \sqrt{2}$ .

(3)  $|-2 + 3i| = \sqrt{(-2)^2 + 3^2} = \sqrt{13}$ .

(4)  $|1 + \sqrt{3}i| = \sqrt{1^2 + (\sqrt{3})^2} = \sqrt{4} = 2$ .

49. (1)  $|(1 + 2i)(2 + i)| = |1 + 2i||2 + i| = \sqrt{1^2 + 2^2}\sqrt{2^2 + 1^2} = \sqrt{5}^2 = 5$ .

(2)  $\left| \frac{1}{3 - \sqrt{3}i} \right| = \frac{|1|}{|3 - \sqrt{3}i|} = \frac{1}{\sqrt{3^2 + (\sqrt{3})^2}} = \frac{1}{\sqrt{12}} = \frac{1}{2\sqrt{3}}$ .

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50. (1) 与式 =  $\frac{6x^6y^7}{9x^2y^6} = \frac{2x^4y}{3}$ .

(2) 与式 =  $\frac{a(a-2b)}{(a+2b)(a-2b)} + \frac{2ab}{(a+2b)(a-2b)} = \frac{a^2 - 2ab + 2ab}{(a+2b)(a-2b)} = \frac{a^2}{(a+2b)(a-2b)}$ .

(3) 与式 =  $\frac{(x-2)(x+1)}{x(x-3)} \times \frac{x-3}{(x+1)(x+2)} \times \frac{x(x+2)}{x-2} = 1$ .

(4) 与式 =  $\frac{\left(1 + \frac{1-x}{x(x+1)}\right) \times x(x+1)}{\left(\frac{1}{x} - \frac{1}{x+1}\right) \times x(x+1)} = \frac{x(x+1) + 1 - x}{(x+1) - x} = x^2 + x + 1 - x = x^2 + 1$ .

51. (1) 与式 =  $5\sqrt{2} - 2\sqrt{2} + 3\sqrt{2} = 6\sqrt{2}$ .

(2) 与式 =  $\sqrt{12} + \sqrt{6} - \sqrt{6} - \sqrt{3} = 2\sqrt{3} - \sqrt{3} = \sqrt{3}$ .

(3) 与式 =  $\frac{\sqrt{2}(\sqrt{2}-1)}{(\sqrt{2}+1)(\sqrt{2}-1)} \cdot \frac{2-\sqrt{2}}{(2+\sqrt{2})(2-\sqrt{2})} = \frac{2-\sqrt{2}}{2-1} \cdot \frac{2-\sqrt{2}}{4-2} = \frac{(2-\sqrt{2})^2}{2} = \frac{4-4\sqrt{2}+2}{2} = 3-2\sqrt{2}$ .

(4) 与式 =  $\frac{\sqrt{7}+\sqrt{5}}{(\sqrt{7}-\sqrt{5})(\sqrt{7}+\sqrt{5})} + \frac{\sqrt{7}-\sqrt{5}}{(\sqrt{7}+\sqrt{5})(\sqrt{7}-\sqrt{5})} = \frac{\sqrt{7}+\sqrt{5}+\sqrt{7}-\sqrt{5}}{7-5} = \frac{2\sqrt{7}}{2} = \sqrt{7}$ .

52. (1) 与式 =  $|-2| = 2$ .

(2) 与式 =  $|(2\sqrt{6}-5)(2\sqrt{6}+5)| = |24-25| = |-1| = 1$ .

(3) 与式 =  $(\sqrt{2}-2)^2 + (\sqrt{2}+2)^2 = 2 - 4\sqrt{2} + 4 + 2 + 4\sqrt{2} + 4 = 12$ .

(4) 与式 =  $\sqrt{5} - 2 + \{-(\sqrt{5}-5)\} = \sqrt{5} - 2 - \sqrt{5} + 5 = 3$ . ( $\sqrt{5}-2 > 0, \sqrt{5}-5 < 0$ )

53. (1) 与式 =  $8 - 2i + 12i - 3i^2 = 11 + 10i$ .

(2) 与式 =  $9 + 12i + 4i^2 = 5 + 12i$ .

(3) 与式 =  $\sqrt{2i} \cdot \sqrt{18i} = \sqrt{36i^2} = -6$ .

(4) 与式 =  $\frac{\sqrt{27}}{\sqrt{3i}} = \frac{3\sqrt{3i}}{\sqrt{3i^2}} = -3i$ .

54. (1)  $|(3+i)(1-2i)| = |3+i||1-2i| = \sqrt{3^2+1^2}\sqrt{1^2+(-2)^2} = \sqrt{10}\sqrt{5} = 5\sqrt{2}$ .

(2)  $\left| \frac{4-3i}{2+i} \right| = \frac{|4-3i|}{|2+i|} = \frac{\sqrt{4^2+(-3)^2}}{\sqrt{2^2+1^2}} = \frac{\sqrt{25}}{\sqrt{5}} = \sqrt{5}$ .

55. (1) 与式 =  $\{(2+\sqrt{3})+\sqrt{7}\}\{(2+\sqrt{3})-\sqrt{7}\} = (2+\sqrt{3})^2 - (\sqrt{7})^2 = 4 + 4\sqrt{3} + 3 - 7 = 4\sqrt{3}$ .

(2) 与式 =  $\frac{\sqrt{3}+1}{(\sqrt{3}-1)(\sqrt{3}+1)} + \frac{\sqrt{5}-\sqrt{3}}{(\sqrt{5}+\sqrt{3})(\sqrt{5}-\sqrt{3})} = \frac{\sqrt{3}+1}{3-1} + \frac{\sqrt{5}-\sqrt{3}}{5-3} = \frac{\sqrt{3}+1}{2} + \frac{\sqrt{5}-\sqrt{3}}{2} = \frac{1+\sqrt{5}}{2}$ .

56. (1) 与式 =  $(1+2i) + (1-2i) = 1+2i+1-2i = 2$ .

(2) 与式 =  $(1+2i)^2 = 1+4i+4i^2 = -3+4i$ .

(3) 与式 =  $|1+2i|^2 = (\sqrt{1^2+2^2})^2 = 5$ .