

## Basic

36.

$$\begin{aligned} (1) \text{ 与式} &= \frac{18x^2y^5z}{8x^3y^6z^3} \\ &= \frac{9}{4xyz^2} \end{aligned}$$

$$\begin{aligned} (2) \text{ 与式} &= \frac{xy^2(x+y)}{y(x^2-y^2)} \\ &= \frac{xy^2(x+y)}{y(x+y)(x-y)} \\ &= \frac{xy}{x-y} \end{aligned}$$

$$\begin{aligned} (3) \text{ 与式} &= \frac{\{x+(y-1)\}\{x-(y-1)\}}{\{(x+y)+1\}\{(x+y)-1\}} \\ &= \frac{(x+y-1)(x-y+1)}{(x+y+1)(x+y-1)} \\ &= \frac{x-y+1}{x+y+1} \end{aligned}$$

$$\begin{aligned} (4) \text{ 与式} &= \frac{(x-2)(x-4)}{(x-2)(x^2+2x+4)} \\ &= \frac{x-4}{x^2+2x+4} \end{aligned}$$

37.

$$\begin{aligned} (1) \text{ 与式} &= \frac{2(x+3)}{(x+2)(x+3)} + \frac{x+2}{(x+2)(x+3)} \\ &= \frac{2x+6+x+2}{(x+2)(x+3)} \\ &= \frac{3x+8}{(x+2)(x+3)} \end{aligned}$$

$$\begin{aligned} (2) \text{ 与式} &= \frac{x-y}{x+y} + \frac{2xy}{(x+y)(x-y)} \\ &= \frac{(x-y)^2}{(x+y)(x-y)} + \frac{2xy}{(x+y)(x-y)} \\ &= \frac{x^2-2xy+y^2+2xy}{(x+y)(x-y)} \\ &= \frac{x^2+y^2}{(x+y)(x-y)} \end{aligned}$$

$$\begin{aligned} (3) \text{ 与式} &= \frac{(a+b)^2}{(a+b)(a-b)} + \frac{(a-b)^2}{(a+b)(a-b)} \\ &= \frac{a^2+2ab+b^2-(a^2-2ab+b^2)}{(a+b)(a-b)} \\ &= \frac{4ab}{(a+b)(a-b)} \end{aligned}$$

$$\begin{aligned} (4) \text{ 与式} &= \frac{1}{2a-1} + \frac{1}{2a+1} - \frac{2}{(2a+1)(2a-1)} \\ &= \frac{2a+1}{(2a+1)(2a-1)} + \frac{2a-1}{(2a+1)(2a-1)} \\ &\quad - \frac{2}{(2a+1)(2a-1)} \\ &= \frac{2a+1+2a-1-2}{(2a+1)(2a-1)} \\ &= \frac{4a-2}{(2a+1)(2a-1)} \\ &= \frac{2(2a-1)}{(2a+1)(2a-1)} \\ &= \frac{2}{2a+1} \end{aligned}$$

38.

$$\begin{aligned} (1) \text{ 与式} &= \frac{-8x^3y^3 \cdot 6z^3}{9z^2 \cdot x^4y^2} \\ &= -\frac{16yz}{3x} \end{aligned}$$

$$\begin{aligned} (2) \text{ 与式} &= \frac{(a+b)(a+3b)}{(a+2b)(a^2-2ab+4b^2)} \cdot \frac{a+2b}{a(a+b)} \\ &= \frac{(a+b)(a+3b) \cdot (a+2b)}{(a+2b)(a^2-2ab+4b^2) \cdot a(a+b)} \\ &= \frac{a+3b}{a(a^2-2ab+4b^2)} \end{aligned}$$

39.

$$\begin{aligned}
 (1) \text{ 与式} &= \frac{(1 - \frac{1}{a}) \cdot a^2}{(a - \frac{1}{a^2}) \cdot a^2} \\
 &= \frac{a^2 - a}{a^3 - 1} \\
 &= \frac{a(a-1)}{(a-1)(a^2 + a + 1)} \\
 &= \frac{a}{a^2 + a + 1}
 \end{aligned}$$

$$\begin{aligned}
 (2) \text{ 与式} &= \frac{(x+1 - \frac{4}{x+1}) \cdot (x+1)}{(1 - \frac{2}{x+1}) \cdot (x+1)} \\
 &= \frac{(x+1)^2 - 4}{x+1-2} \\
 &= \frac{\{(x+1)+2\}\{(x+1)-2\}}{x-1} \\
 &= \frac{(x+3)(x-1)}{x-1} \\
 &= x+3
 \end{aligned}$$

40.

(1)

$$\begin{array}{r}
 x-2 \overline{) \begin{array}{r} x-1 \\ x^2-3x+3 \\ x^2-2x \\ \hline -x+3 \\ -x+2 \\ \hline 1 \end{array}}
 \end{array}$$

$$\text{与式} = x-1 + \frac{1}{x-2}$$

(2)

$$\begin{array}{r}
 x^2-2x+3 \overline{) \begin{array}{r} x+5 \\ x^3+3x^2-4x+7 \\ x^3-2x^2+3x \\ \hline 5x^2-7x+7 \\ 5x^2-10x+15 \\ \hline 3x-8 \end{array}}
 \end{array}$$

$$\text{与式} = x+5 + \frac{3x-8}{x^2-2x+3}$$

41.

$$(1) |1-4| + |2-1| = (4-1) + (2-1) = 4$$

$$(2) |7-4| + |2-7| = (7-4) + (7-2) = 8$$

$$(3) |\pi-4| + |2-\pi| = (4-\pi) + (\pi-2) = 2$$

42.

$$(1) \text{ 与式} = 2\sqrt{2} - 4\sqrt{2} + 6\sqrt{2} = 4\sqrt{2}$$

$$\begin{aligned}
 (2) \text{ 与式} &= 2\sqrt{2} \cdot \sqrt{2} + 2\sqrt{2} \cdot 4\sqrt{3} \\
 &\quad - \sqrt{3} \cdot \sqrt{2} - \sqrt{3} \cdot 4\sqrt{3} \\
 &= 4 + 8\sqrt{6} - \sqrt{6} - 12 \\
 &= -8 + 7\sqrt{6}
 \end{aligned}$$

$$\begin{aligned}
 (3) \text{ 与式} &= \frac{3\sqrt{3}}{12\sqrt{3}} \\
 &= \frac{1}{4}
 \end{aligned}$$

$$\begin{aligned}
 (4) \text{ 与式} &= (\sqrt{2})^2 + 2 \cdot \sqrt{2} \cdot \frac{1}{\sqrt{2}} + (\frac{1}{\sqrt{2}})^2 \\
 &= 2 + 2 + \frac{1}{2} \\
 &= \frac{9}{2}
 \end{aligned}$$

43.

$$(1) \text{ 与式} = |3 - \sqrt{3}| = 3 - \sqrt{3}$$

$$(2) \text{ 与式} = |2 - 3\sqrt{2}| = 3\sqrt{2} - 2$$

44.

$$\begin{aligned}
 (1) \text{ 与式} &= \frac{4\sqrt{3} \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} \\
 &= \frac{4\sqrt{6}}{2} \\
 &= 2\sqrt{6}
 \end{aligned}$$

$$\begin{aligned}
 (2) \text{ 与式} &= \frac{\sqrt{5} - \sqrt{3}}{(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})} \\
 &= \frac{\sqrt{5} - \sqrt{3}}{5 - 3} \\
 &= \frac{\sqrt{5} - \sqrt{3}}{2}
 \end{aligned}$$

$$\begin{aligned}
 (3) \text{ 与式} &= \frac{\sqrt{6}(\sqrt{3} + \sqrt{2})}{(\sqrt{3} - \sqrt{2})(\sqrt{3} + \sqrt{2})} \\
 &= \frac{3\sqrt{2} + 2\sqrt{3}}{3 - 2} \\
 &= 3\sqrt{2} + 2\sqrt{3}
 \end{aligned}$$

$$\begin{aligned}
 (4) \text{ 与式} &= \frac{(3 - 2\sqrt{2})(3 - 2\sqrt{2})}{(3 + 2\sqrt{2})(3 - 2\sqrt{2})} \\
 &= \frac{9 - 12\sqrt{2} + 8}{9 - 8} \\
 &= 17 - 12\sqrt{2}
 \end{aligned}$$

45.

$$\begin{aligned}
 (1) \text{ 与式} &= 2 + 3 - 3i + 4i \\
 &= 5 + i
 \end{aligned}$$

$$\begin{aligned}
 (2) \text{ 与式} &= 4 - 2 + i + 7i \\
 &= 2 + 8i
 \end{aligned}$$

$$\begin{aligned}
 (3) \text{ 与式} &= 3 - 5i + 9i - 15i^2 \\
 &= 3 + 4i + 15 \\
 &= 18 + 4i
 \end{aligned}$$

$$\begin{aligned}
 (4) \text{ 与式} &= 4 + 12i + 9i^2 \\
 &= 4 + 12i - 9 \\
 &= -5 + 12i
 \end{aligned}$$

$$\begin{aligned}
 (5) \text{ 与式} &= \frac{(1 - i)(1 - i)}{(1 + i)(1 - i)} \\
 &= \frac{1 - 2i + i^2}{1 - i^2} \\
 &= \frac{-2i}{2} \\
 &= -i
 \end{aligned}$$

$$\begin{aligned}
 (6) \text{ 与式} &= \frac{(1 - 3i) + (1 + 3i)}{(1 + 3i)(1 - 3i)} \\
 &= \frac{2}{1 - 9i^2} \\
 &= \frac{2}{10} \\
 &= \frac{1}{5}
 \end{aligned}$$

46.

$$\begin{aligned}
 (1) \text{ 与式} &= (\sqrt{3}i)^2 \\
 &= 3i^2 \\
 &= -3
 \end{aligned}$$

$$\begin{aligned}
 (2) \text{ 与式} &= \sqrt{8}i \cdot \sqrt{2}i \\
 &= 4i^2 \\
 &= -4
 \end{aligned}$$

$$\begin{aligned}
 (3) \text{ 与式} &= 2\sqrt{2}i + \sqrt{2}i \\
 &= 3\sqrt{2}i
 \end{aligned}$$

$$\begin{aligned}
 (4) \text{ 与式} &= \sqrt{5}i \cdot \sqrt{5} \\
 &= 5i
 \end{aligned}$$

$$\begin{aligned}
 (5) \text{ 与式} &= \sqrt{2} \cdot \sqrt{3}i \\
 &= \sqrt{6}i
 \end{aligned}$$

$$\begin{aligned}
 (6) \text{ 与式} &= \frac{\sqrt{12}i}{\sqrt{3}i} \\
 &= \sqrt{4} \\
 &= 2
 \end{aligned}$$

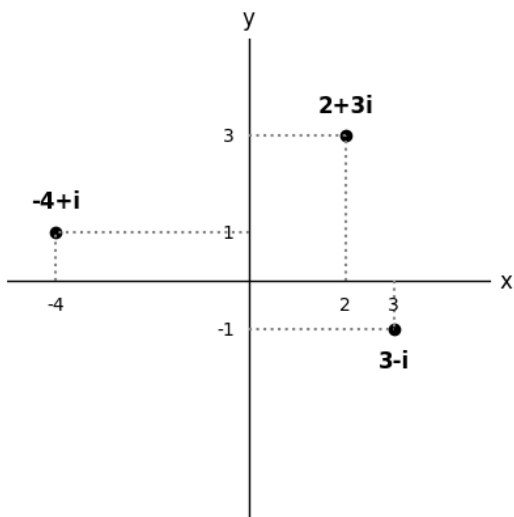
$$\begin{aligned}
 (7) \text{ 与式} &= \frac{\sqrt{8}}{\sqrt{2}i} \\
 &= -\sqrt{4}i \\
 &= -2i
 \end{aligned}$$

$$\begin{aligned}
 (8) \text{ 与式} &= \frac{\sqrt{27}i}{\sqrt{3}} \\
 &= \sqrt{9}i \\
 &= 3i
 \end{aligned}$$

47.

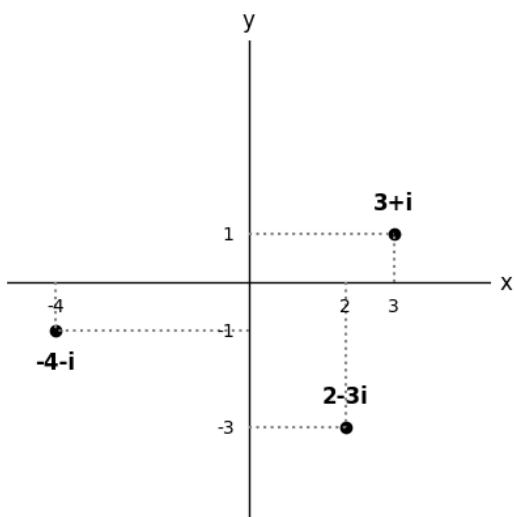
- ( 1 )  $1 + 3i$   
 ( 2 )  $3 - 2i$   
 ( 3 )  $-3 + i$   
 ( 4 )  $-3i$

48.



49.

- ( 1 )  $\overline{2+3i} = 2 - 3i$   
 ( 2 )  $\overline{-4+i} = -4 - i$   
 ( 3 )  $\overline{3-i} = 3 + i$



50.

- ( 1 ) 与式  $= 4 + 3i + 4 - 3i$   
 $= 8$

$$\begin{aligned} \text{( 2 ) 与式} &= (4 + 3i)(4 - 3i) \\ &= 16 - 9i^2 \\ &= 16 + 9 \\ &= \mathbf{25} \end{aligned}$$

$$\begin{aligned} \text{( 3 ) 与式} &= 3 - 2i - (3 + 2i) \\ &= 3 - 2i - 3 - 2i \\ &= \mathbf{-4i} \end{aligned}$$

$$\begin{aligned} \text{( 4 ) 与式} &= (3 - 2i)(3 + 2i) \\ &= 9 - 4i^2 \\ &= 9 + 4 \\ &= \mathbf{13} \end{aligned}$$

51.

$$\begin{aligned} \text{( 1 ) 与式} &= |1 + i| \\ &= \sqrt{1^2 + 1^2} \\ &= \mathbf{\sqrt{2}} \end{aligned}$$

$$\begin{aligned} \text{( 2 ) 与式} &= |1 - i| \\ &= \sqrt{1^2 + (-1)^2} \\ &= \mathbf{\sqrt{2}} \end{aligned}$$

$$\begin{aligned} \text{( 3 ) 与式} &= |-3i| \\ &= \sqrt{0 + (-3)^2} \\ &= \mathbf{3} \end{aligned}$$

$$\begin{aligned} \text{( 4 ) 与式} &= |1 + 2i| \\ &= \sqrt{1^2 + 2^2} \\ &= \mathbf{\sqrt{5}} \end{aligned}$$

$$\begin{aligned} \text{( 5 ) 与式} &= |-3 - 4i| \\ &= \sqrt{(-3)^2 + (-4)^2} \\ &= \mathbf{5} \end{aligned}$$

$$\begin{aligned} \text{( 6 ) 与式} &= |1 + \sqrt{3}i| \\ &= \sqrt{1^2 + (\sqrt{3})^2} \\ &= \mathbf{2} \end{aligned}$$

**Check**

52.

$$\begin{aligned} (1) \text{ 与式} &= \frac{6x^4y^6}{8x^3y^9} \\ &= \frac{3x}{4y^3} \end{aligned}$$

$$\begin{aligned} (2) \text{ 与式} &= \frac{a}{a+3b} + \frac{3ab}{(a+3b)(a-3b)} \\ &= \frac{a(a-3b) + 3ab}{(a+3b)(a-3b)} \\ &= \frac{a^2 - 3ab + 3ab}{(a+3b)(a-3b)} \\ &= \frac{a^2}{(a+3b)(a-3b)} \end{aligned}$$

$$\begin{aligned} (3) \text{ 与式} &= -\frac{y}{x} \cdot \frac{y^3}{x^2} \cdot \left(-\frac{x^3}{y^2}\right) \\ &= \frac{x^3y^4}{x^3y^2} \\ &= y^2 \end{aligned}$$

$$\begin{aligned} (4) \text{ 与式} &= \frac{(x-1)^2}{x(x-2)} \cdot \frac{x-2}{(x+1)(x+2)} \cdot \frac{x(x+1)}{x-1} \\ &= \frac{x-1}{x+2} \end{aligned}$$

$$\begin{aligned} (5) \text{ 与式} &= \frac{x^2 - 2x}{x^2 + 3x - 10} \\ &= \frac{x(x-2)}{(x-2)(x+5)} \\ &= \frac{x}{x+5} \end{aligned}$$

$$\begin{aligned} (6) \text{ 与式} &= \frac{x(x+2) + 2 - x^2}{x+2-x} \\ &= \frac{2x+2}{2} \\ &= x+1 \end{aligned}$$

53.

(1)

$$\begin{array}{r} x^2 - 4x + 3 \quad \left) \begin{array}{r} x+1 \\ x^3 - 3x^2 - \quad x + 6 \\ \underline{x^3 - 4x^2 + 3x} \phantom{+ 6} \\ x^2 - 4x + 6 \\ \underline{x^2 - 4x + 3} \\ 3 \end{array} \end{array}$$

$$\text{与式} = x + 1 + \frac{3}{x^2 - 4x + 3}$$

(2)

$$\begin{array}{r} x^2 - 3x + 2 \quad \left) \begin{array}{r} x-2 \\ x^3 - \quad 5x^2 + 9x + 2 \\ \underline{x^3 - \quad 3x^2 + 2x} \phantom{+ 2} \\ -2x^2 + 7x + 2 \\ \underline{-2x^2 + 6x - 4} \\ x + 6 \end{array} \end{array}$$

$$\text{与式} = x - 2 + \frac{x+6}{x^2 - 3x + 2}$$

54.

$$\begin{aligned} (1) \text{ 与式} &= 3\sqrt{2} - 2\sqrt{2} + 4\sqrt{2} \\ &= 5\sqrt{2} \end{aligned}$$

$$\begin{aligned} (2) \text{ 与式} &= \sqrt{20} - \sqrt{10} + \sqrt{10} - \sqrt{5} \\ &= 2\sqrt{5} - \sqrt{5} \\ &= \sqrt{5} \end{aligned}$$

$$\begin{aligned} (3) \text{ 与式} &= \frac{2\sqrt{3}}{(\sqrt{3}+1)(3-\sqrt{3})} \\ &= \frac{2\sqrt{3}}{3\sqrt{3}-3+3-\sqrt{3}} \\ &= \frac{2\sqrt{3}}{2\sqrt{3}} \\ &= 1 \end{aligned}$$

$$(4) X = 2 + \sqrt{3} \text{ として}$$

$$\begin{aligned} \text{与式} &= (X + \sqrt{7})(X - \sqrt{7}) \\ &= X^2 - 7 \\ &= (2 + \sqrt{3})^2 - 7 \\ &= 4 + 4\sqrt{3} + 3 - 7 \\ &= 4\sqrt{3} \end{aligned}$$

55.

$$\begin{aligned} (1) \text{ 与式} &= |1 - \sqrt{2}| \\ &= \sqrt{2} - 1 \end{aligned}$$

$$\begin{aligned} (2) \text{ 与式} &= \frac{\sqrt{3} + 1}{(\sqrt{3} - 1)(\sqrt{3} + 1)} \\ &\quad + \frac{\sqrt{5} - \sqrt{3}}{(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})} \\ &= \frac{\sqrt{3} + 1}{3 - 1} + \frac{\sqrt{5} - \sqrt{3}}{5 - 3} \\ &= \frac{\sqrt{3} + 1 + \sqrt{5} - \sqrt{3}}{2} \\ &= \frac{1 + \sqrt{5}}{2} \end{aligned}$$

56.

$$\begin{aligned} (1) \text{ 与式} &= |5 - 7| \\ &= |7 - 5| \\ &= 2 \end{aligned}$$

$$\begin{aligned} (2) \text{ 与式} &= (3 + 2\sqrt{3} + 1) - (3 - 2\sqrt{3} + 1) \\ &= 3 + 2\sqrt{3} + 1 - 3 + 2\sqrt{3} - 1 \\ &= 4\sqrt{3} \end{aligned}$$

$$\begin{aligned} (3) \text{ 与式} &= |6 - 2\sqrt{5}| |6 + 2\sqrt{5}| \\ &= 36 - 20 \\ &= 16 \end{aligned}$$

$$\begin{aligned} (4) \text{ 与式} &= |\sqrt{5} - 1| + |3 - \sqrt{5}| \\ &= \sqrt{5} - 1 + 3 - \sqrt{5} \\ &= 2 \end{aligned}$$

57.

$$\begin{aligned} (1) \text{ 与式} &= 6 - 9i + 4i - 6i^2 \\ &= 6 - 5i + 6 \\ &= 12 - 5i \end{aligned}$$

$$\begin{aligned} (2) \text{ 与式} &= -\frac{1}{2i}(1 + 2i + i^2) \\ &= \frac{1}{2i} + 1 + \frac{1}{2}i \\ &= -\frac{1}{2}i + 1 + \frac{1}{2}i \\ &= 1 \end{aligned}$$

$$\begin{aligned} (3) \text{ 与式} &= \sqrt{3}i \cdot 3\sqrt{3}i \\ &= 9i^2 \\ &= -9 \end{aligned}$$

$$\begin{aligned} (4) \text{ 与式} &= \frac{4\sqrt{2}}{\sqrt{2}i} \\ &= -4i \end{aligned}$$

58.

$$\begin{aligned} (1) \text{ 与式} &= |3 - 2i| \\ &= \sqrt{3^2 + (-2)^2} \\ &= \sqrt{13} \end{aligned}$$

$$\begin{aligned} (2) \text{ 与式} &= |(2 - i)(1 - 2i)| \\ &= |2 - 4i - i + 2i^2| \\ &= |2 - 5i - 2| \\ &= |-5i| \\ &= \sqrt{0^2 + (-5)^2} \\ &= 5 \end{aligned}$$

$$\begin{aligned} (3) \text{ 与式} &= \left| \frac{2 - i}{2 + i} \right| \\ &= \frac{\sqrt{2^2 + (-1)^2}}{\sqrt{2^2 + 1^2}} \\ &= \frac{\sqrt{5}}{\sqrt{5}} \\ &= 1 \end{aligned}$$

$$\begin{aligned} (4) \text{ 与式} &= \left| \frac{3 - 4i}{1 + 2i} \right| \\ &= \frac{\sqrt{3^2 + (-4)^2}}{\sqrt{1^2 + 2^2}} \\ &= \frac{5}{\sqrt{5}} \\ &= \sqrt{5} \end{aligned}$$

59.

$$\begin{aligned} (1) \text{ 与式} &= 2 + 3i + \overline{2 + 3i} \\ &= 2 + 3i + 2 - 3i \\ &= 4 \end{aligned}$$

$$\begin{aligned}
 (2) \text{ 与式} &= (2+3i)^2 \\
 &= 4+12i+9i^2 \\
 &= 4+12i-9 \\
 &= -5+12i
 \end{aligned}$$

$$\begin{aligned}
 (3) \text{ 与式} &= |2+3i|^2 \\
 &= (\sqrt{2^2+3^2})^2 \\
 &= 13
 \end{aligned}$$

$$\begin{aligned}
 (4) \text{ 与式} &= (2+3i)(\overline{2+3i}) \\
 &= (2+3i)(2-3i) \\
 &= 4-9i^2 \\
 &= 4+9 \\
 &= 13
 \end{aligned}$$

### Step up

60.

$$\begin{aligned}
 (1) \text{ 与式} &= \frac{3}{(x-2)(x-3)} - \frac{2}{(x-3)(x-1)} \\
 &\quad - \frac{1}{(x-2)(x-1)} \\
 &= \frac{3(x-1) - 2(x-2) - (x-3)}{(x-1)(x-2)(x-3)} \\
 &= \frac{3x-2x-x-3+4+3}{(x-1)(x-2)(x-3)} \\
 &= \frac{4}{(x-1)(x-2)(x-3)}
 \end{aligned}$$

(2) 与式

$$\begin{aligned}
 &= \frac{-(b+c)}{(a-b)(c-a)} + \frac{-(c+a)}{(b-c)(a-b)} + \frac{-(a+b)}{(c-a)(b-c)} \\
 &= \frac{-(b+c)(b-c) - (c+a)(c-a) - (a+b)(a-b)}{(a-b)(b-c)(c-a)} \\
 &= \frac{-(b^2-c^2) - (c^2-a^2) - (a^2-b^2)}{(a-b)(b-c)(c-a)} \\
 &= \frac{-b^2+c^2-c^2+a^2-a^2+b^2}{(a-b)(b-c)(c-a)} \\
 &= 0
 \end{aligned}$$

$$\begin{aligned}
 (3) \text{ 与式} &= \frac{(x-y)^2}{(x-y)(x^2+xy+y^2)} \cdot \left(-\frac{x-y}{xy(x+y)}\right) \\
 &= -\frac{x+y}{xy(x^2+xy+y^2)}
 \end{aligned}$$

$$\begin{aligned}
 (4) \text{ 与式} &= \frac{(2x+3y)(x+y)}{(x-y)^2} \cdot \frac{(x+y)(x-y)}{(2x-y)(x+y)} \\
 &\quad \cdot \frac{(2x-y)(x-y)}{(2x-3y)(x+y)} \\
 &= \frac{2x+3y}{2x-3y}
 \end{aligned}$$

61.

$$\begin{aligned}
 (1) \text{ 与式} &= \frac{(x+1)(x+1) - (x-1)(x-1)}{(x+1)(x+1) + (x-1)(x-1)} \\
 &= \frac{(x+1)^2 - (x-1)^2}{(x+1)^2 + (x-1)^2} \\
 &= \frac{(x^2+2x+1) - (x^2-2x+1)}{(x^2+2x+1) + (x^2-2x+1)} \\
 &= \frac{4x}{2x^2+2} \\
 &= \frac{2x}{x^2+1}
 \end{aligned}$$

$$\begin{aligned}
 (2) \text{ 与式} &= \frac{2(t+2) + (t+2)(t-2)}{2(t+2) - (t+2)(t-2)} \\
 &= \frac{2t+4+t^2-4}{2t+4-(t^2-4)} \\
 &= \frac{2t+t^2}{2t-t^2} \\
 &= \frac{t(2+t)}{t(2-t)} \\
 &= -\frac{t+2}{t-2}
 \end{aligned}$$

$$\begin{aligned}
 (3) \text{ 与式} &= \frac{a - \frac{a}{a+1}}{a + \frac{a}{a-1}} \\
 &= \frac{a(a+1)(a-1) - a(a-1)}{a(a+1)(a-1) + a(a+1)} \\
 &= \frac{(a-1)\{a(a+1) - a\}}{(a+1)\{a(a-1) + a\}} \\
 &= \frac{a^2(a-1)}{a^2(a+1)} \\
 &= \frac{a-1}{a+1}
 \end{aligned}$$

$$\begin{aligned}
 (4) \text{ 与式} &= \frac{1}{1 - \frac{1}{1 - \frac{x}{x-1}}} \\
 &= \frac{1}{1 - \frac{x-1}{x-1-x}} \\
 &= \frac{1}{1 - \frac{x-1}{-1}} \\
 &= \frac{1}{1+x-1} \\
 &= \frac{1}{x}
 \end{aligned}$$

62.

$$\begin{aligned}
 (1) \text{ 与式} &= \frac{2 + \sqrt{3} - \sqrt{7}}{(2 + \sqrt{3} + \sqrt{7})(2 + \sqrt{3} - \sqrt{7})} \\
 &= \frac{2 + \sqrt{3} - \sqrt{7}}{(2 + \sqrt{3})^2 - (\sqrt{7})^2} \\
 &= \frac{2 + \sqrt{3} - \sqrt{7}}{4 + 4\sqrt{3} + 3 - 7} \\
 &= \frac{2 + \sqrt{3} - \sqrt{7}}{4\sqrt{3}} \\
 &= \frac{2\sqrt{3} + 3 - \sqrt{21}}{12}
 \end{aligned}$$

$$\begin{aligned}
 (2) \text{ 与式} &= \frac{1 + \sqrt{2} + \sqrt{3} + 1 + \sqrt{2} - \sqrt{3}}{(1 + \sqrt{2} - \sqrt{3})(1 + \sqrt{2} + \sqrt{3})} \\
 &= \frac{2 + 2\sqrt{2}}{(1 + \sqrt{2})^2 - (\sqrt{3})^2} \\
 &= \frac{2 + 2\sqrt{2}}{1 + 2\sqrt{2} + 2 - 3} \\
 &= \frac{2(1 + \sqrt{2})}{2\sqrt{2}} \\
 &= \frac{1 + \sqrt{2}}{\sqrt{2}} \\
 &= \frac{2 + \sqrt{2}}{2}
 \end{aligned}$$

63.

(1)  $\alpha = a + bi, \beta = c + di$  と置く

$$\begin{aligned}
 |\alpha| &= |a + bi| \\
 &= \sqrt{a^2 + b^2} \\
 |\bar{\alpha}| &= |\overline{a + bi}| \\
 &= \sqrt{a^2 + (-b)^2} \\
 &= \sqrt{a^2 + b^2}
 \end{aligned}$$

(2)

$$\begin{aligned}
 |\alpha + \beta|^2 &= (\alpha + \beta)(\overline{\alpha + \beta}) \\
 &= (\alpha + \beta)(\bar{\alpha} + \bar{\beta}) \\
 &= \alpha\bar{\alpha} + \alpha\bar{\beta} + \bar{\alpha}\beta + \beta\bar{\beta} \\
 &= |\alpha|^2 + \alpha\bar{\beta} + \bar{\alpha}\beta + |\beta|^2
 \end{aligned}$$

(3)

$$\begin{aligned}
 |\alpha| &= |\beta \cdot \frac{\alpha}{\beta}| \\
 &= |\beta| |\frac{\alpha}{\beta}| \\
 \frac{|\alpha|}{|\beta|} &= \frac{1}{|\beta|} \cdot |\beta| |\frac{\alpha}{\beta}| \\
 &= |\frac{\alpha}{\beta}|
 \end{aligned}$$

64.

$$\begin{aligned}
 \text{左辺} &= \sqrt{(\sqrt{a} + \sqrt{b})^2} \\
 &= \sqrt{a} + \sqrt{b} = \text{右辺}
 \end{aligned}$$

65.

$$\begin{aligned}
 (1) \text{ 与式} &= \sqrt{1 + 2\sqrt{2} + 2} \\
 &= \sqrt{(1 + \sqrt{2})^2} \\
 &= \sqrt{2} + 1
 \end{aligned}$$

$$\begin{aligned}
 (2) \text{ 与式} &= \sqrt{3 + 2 - 2\sqrt{6}} \\
 &= \sqrt{(\sqrt{3} - \sqrt{2})^2} \\
 &= \sqrt{3} - \sqrt{2}
 \end{aligned}$$

$$\begin{aligned}
 (3) \text{ 与式} &= \sqrt{4 + 2 - 2\sqrt{8}} \\
 &= \sqrt{(\sqrt{4} - \sqrt{2})^2} \\
 &= 2 - \sqrt{2}
 \end{aligned}$$



$$\begin{aligned}
 (4) \text{ 与式} &= \sqrt{4+3-2\sqrt{12}} \\
 &= \sqrt{(\sqrt{4}-\sqrt{3})^2} \\
 &= \mathbf{2-\sqrt{3}}
 \end{aligned}$$

$$\begin{aligned}
 (5) \text{ 与式} &= \sqrt{\frac{1}{2}+\frac{3}{2}+2\sqrt{\frac{3}{2}}} \\
 &= \sqrt{(\sqrt{\frac{1}{2}}+\sqrt{\frac{3}{2}})^2} \\
 &= \frac{1}{\sqrt{2}}+\frac{\sqrt{3}}{\sqrt{2}} \\
 &= \frac{\mathbf{\sqrt{6}+\sqrt{2}}}{2}
 \end{aligned}$$

$$\begin{aligned}
 (6) \text{ 与式} &= \sqrt{\frac{7}{2}+\frac{1}{2}-2\sqrt{\frac{7}{2}}} \\
 &= \sqrt{(\sqrt{\frac{7}{2}}-\sqrt{\frac{1}{2}})^2} \\
 &= \frac{\sqrt{7}}{\sqrt{2}}-\frac{1}{\sqrt{2}} \\
 &= \frac{\mathbf{\sqrt{14}-\sqrt{2}}}{2}
 \end{aligned}$$

**66.**

$$\begin{aligned}
 (1) \text{ 与式} &= \sqrt{(\sqrt{x}-1)^2} \\
 &= \mathbf{\sqrt{x}-1}
 \end{aligned}$$

$$\begin{aligned}
 (2) \text{ 与式} &= \sqrt{(\sqrt{a}+\sqrt{1-a})^2} \\
 &= \mathbf{\sqrt{a}+\sqrt{1-a}}
 \end{aligned}$$

**67.**

$$\begin{aligned}
 \text{与式} &= \frac{5}{\sqrt{(\sqrt{6}-1)^2}} \\
 &= \frac{5}{\sqrt{6}-1} \\
 &= \frac{5(\sqrt{6}+1)}{(\sqrt{6}-1)(\sqrt{6}+1)} \\
 &= \frac{5\sqrt{6}+5}{6-1} \\
 &= \mathbf{\sqrt{6}+1}
 \end{aligned}$$

$2 < \sqrt{6} < 3$  より,  $3 < \sqrt{6}+1 < 4$   
よって  $a=3, b=\sqrt{6}+1-3=\sqrt{6}-2$

$$\begin{aligned}
 \frac{1}{a}+\frac{1}{b} &= \frac{1}{3}+\frac{1}{\sqrt{6}-2} \\
 &= \frac{\sqrt{6}-2+3}{3\sqrt{6}-6} \\
 &= \frac{\sqrt{6}+1}{3\sqrt{6}-6} \\
 &= \frac{(\sqrt{6}+1)(3\sqrt{6}+6)}{(3\sqrt{6}-6)(3\sqrt{6}+6)} \\
 &= \frac{18+9\sqrt{6}+6}{54-36} \\
 &= \frac{24+9\sqrt{6}}{18} \\
 &= \frac{\mathbf{8+3\sqrt{6}}}{6}
 \end{aligned}$$