

1. 次の式を計算せよ。

$$(1) (5x^3 - 3x^2 - 4x + 1) + (3x^3 - 2x^2 - 1)$$

$$= (5+3)x^3 + (-3-2)x^2 - 4x + (1-1)$$

$$= 8x^3 - 5x^2 - 4x$$

$$(2) (3x^2y - 2xy + 5y^2) - (4x^2y - 5xy - y^2)$$

$$= 3x^2y - 2xy + 5y^2 - 4x^2y + 5xy + y^2$$

$$= (3-4)x^2y + (-2+5)xy + (5+1)y^2$$

$$= -x^2y + 3xy + 6y^2$$

2. $A=2x+y+z$, $B=x+2y+z$, $C=x+y+2z$ のとき,
 $2A-3\{A-(B+C)\}$ を計算せよ。

$$\text{与式} = 2A - 3(A - B - C)$$

$$= 2A - 3A + 3B + 3C = -A + 3B + 3C$$

$$= -(2x + y + z) + 3(x + 2y + z) + 3(x + y + 2z)$$

$$= -2x - y - z + 3x + 6y + 3z + 3x + 3y + 6z$$

$$= (-2 + 3 + 3)x + (-1 + 6 + 3)y + (-1 + 3 + 6)z$$

$$= 4x + 8y + 8z$$

3. 次の式を展開せよ。

$$(1) (x-3y)^2$$

$$= x^2 - 2 \cdot x \cdot 3y + (3y)^2$$

$$= x^2 - 6xy + 9y^2$$

$$(2) (4a-5b)(4a+5b)$$

$$= (4a)^2 - (5b)^2$$

$$= 16a^2 - 25b^2$$

$$(3) (x+5)(x-3)$$

$$= x^2 + (5-3)x + 5 \cdot (-3)$$

$$= x^2 + 2x - 15$$

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

$$= 2 \cdot 4x^2 + \{2 \cdot 1 + (-3) \cdot 4\}x + (-3) \cdot 1$$

$$= 8x^2 - 10x - 3$$

$$(5) (5a-4b)(2a-3b)$$

$$= 5 \cdot 2a^2 + \{5 \cdot (-3) + (-4) \cdot 2\}ab + (-4) \cdot (-3)b^2$$

$$= 10a^2 - 23ab + 12b^2$$

4. 次の式を展開せよ。

$$(1) (2x-3y-z)^2$$

$$= \{(2x-3y)-z\}^2$$

$$= (2x-3y)^2 - 2(2x-3y)z + z^2$$

$$= (4x^2 - 12xy + 9y^2) - 4xz + 6yz + z^2$$

$$= 4x^2 + 9y^2 + z^2 - 12xy + 6yz - 4zx$$

$$(2) (x-2y+3z)(x+2y-3z)$$

$$= \{x-(2y-3z)\}\{x+(2y-3z)\}$$

$$= x^2 - (2y-3z)^2$$

$$= x^2 - 4y^2 + 12yz - 9z^2$$

$$(3) (x^2+2x-1)(x^2+2x-3)$$

$$= \{(x^2+2x)-1\}\{(x^2+2x)-3\}$$

$$= (x^2+2x)^2 + \{(-1)+(-3)\}(x^2+2x) + (-1) \cdot (-3)$$

$$= (x^4 + 4x^3 + 4x^2) - 4x^2 - 8x + 3$$

$$= x^4 + 4x^3 - 8x + 3$$

5. 次の式を展開せよ。

$$(x^2-3xy+y^2)(x^2-xy-2y^2)$$

$$= (x^2-3xy+y^2)x^2 + (x^2-3xy+y^2) \cdot (-xy) + (x^2-3xy+y^2) \cdot (-2y^2)$$

$$= x^4 - 3x^3y + x^2y^2 - x^3y + 3x^2y^2 - xy^3 - 2x^2y^2 + 6xy^3 - 2y^4$$

$$= x^4 + (-3-1)x^3y + (1+3-2)x^2y^2 + (-1+6)xy^3 - 2y^4$$

$$= x^4 - 4x^3y + 2x^2y^2 + 5xy^3 - 2y^4$$

6. 次の式を因数分解せよ。

$$(1) \quad a(x-2) - x + 2$$

$$= a(x-2) - (x-2)$$

$$= (a-1)(x-2)$$

$$(2) \quad 9a^2 + 12ab + 4b^2$$

$$= (3a)^2 + 2 \cdot 3a \cdot 2b + (2b)^2$$

$$= (3a+2b)^2$$

$$(3) \quad x^2 - 2xy - 24y^2$$

$$= x^2 + (4y-6y)x + 4y \cdot (-6y)$$

$$= (x+4y)(x-6y)$$

$$(4) \quad 2x^2 + 28xy - 144y^2$$

$$= 2(x^2 + 14xy - 72y^2)$$

$$= 2\{x^2 + (-4y+18y)x + (-4y) \cdot 18y\}$$

$$= 2(x-4y)(x+18y)$$

7. 次の式を因数分解せよ。

$$(1) \quad 3x^2 + 10x + 3$$

$$= (x+3)(3x+1)$$

$$(1) \quad \begin{array}{r} 1 \times 3 \rightarrow 9 \\ 3 \times 1 \rightarrow 3 \\ \hline 3 \quad 3 \quad 10 \end{array}$$

$$(2) \quad 6x^2 + 17xy - 14y^2$$

$$= (2x+7y)(3x-2y)$$

$$(2) \quad \begin{array}{r} 2 \times 7y \rightarrow 14y \\ 3 \times -2y \rightarrow -6y \\ \hline 6 \quad -14y^2 \quad 17y \end{array}$$

$$(3) \quad (x+2y)^2 - 2(x+2y) - 3$$

$$= \{(x+2y)+1\}\{(x+2y)-3\}$$

$$= (x+2y+1)(x+2y-3)$$

8. 次の式を因数分解せよ。

$$(1) \quad (x-y)^2 + 3(x-y) - 4$$

$$= \{(x-y)-1\}\{(x-y)+4\}$$

$$= (x-y-1)(x-y+4)$$

$$(2) \quad (x-2)^2 - 3(x-2) - 18$$

$$= \{(x-2)+3\}\{(x-2)-6\}$$

$$= (x+1)(x-8)$$

$$\begin{array}{r} 1 \times 3 \rightarrow 3 \\ 2 \times -1 \rightarrow -2 \\ \hline 2 \quad -3 \quad 5 \end{array}$$

$$(3) \quad (x+2y)^2 - 2(x+2y) + 1$$

$$= \{(x+2y)-1\}^2$$

$$= (x+2y-1)^2$$

$$(4) \quad 2(x+y)^2 + 5(x+y) - 3$$

$$= \{(x+y)+3\}\{2(x+y)-1\}$$

$$= (x+y+3)(2x+2y-1)$$

$$(5) \quad x^2 - (y-4)^2$$

$$= \{x+(y-4)\}\{x-(y-4)\}$$

$$= (x+y-4)(x-y+4)$$

$$(6) \quad (x-y)^2 - 9z^2$$

$$= (x-y)^2 - (3z)^2 = \{(x-y)+3z\}\{(x-y)-3z\}$$

$$= (x-y+3z)(x-y-3z)$$

9. 次の式を因数分解せよ。

$$(1) \quad x^4 - 2x^2 - 8$$

$$= (x^2)^2 - 2x^2 - 8 = (x^2+2)(x^2-4)$$

$$= (x^2+2)(x+2)(x-2)$$

$$(2) \quad x^4 - 17x^2 + 16$$

$$= (x^2-1)(x^2-16)$$

$$= (x+1)(x-1)(x+4)(x-4)$$

$$(3) \quad x^4 - 8x^2 + 16$$

$$= (x^2)^2 - 2 \cdot 4x^2 + 4^2 = (x^2-4)^2$$

$$= \{(x+2)(x-2)\}^2 = (x+2)^2(x-2)^2$$

$$(4) \quad x^4 - 81$$

$$= (x^2)^2 - 9^2 = (x^2+9)(x^2-9)$$

$$= (x^2+9)(x+3)(x-3)$$

