

数学 I 新訂版 問題解答集 実教出版

1章 数と式

1 式の計算

●練習 1

- (1) 次数は 3, 係数は 4
- (2) 次数は 3, 係数は 4
- (3) 次数は 4, 係数は -2

●練習 2

- (1) x について: 次数は 1, 係数は $-6a^3$
- (2) z について: 次数は 1, 係数は $7xy^2$
 x, y について: 次数は 3, 係数は $7z$

●練習 3

- (1) $5x^2 - x - 7$
- (2) $3x^2 - 5ax - 2a^2$
- (3) $2x^2 - 3xy$

●練習 4

- (1) 3 次式
- (2) 4 次式
- (3) 6 次式

●練習 5

- (1) $-2x^3 + x^2 + 4x + 1$
3 次式
 x^3 の係数は -2 , x^2 の係数は 1, x の係数は 4
定数項は 1
- (2) $5x^2 + (2y-3)x + (2y^2 - y + 7)$
2 次式
 x^2 の係数は 5, x の係数は $2y-3$
定数項は $2y^2 - y + 7$
- (3) $-x^2 + (2a+b)x + a-1$
2 次式
 x^2 の係数は -1 , x の係数は $2a+b$
定数項は $a-1$

●練習 6

- (1) $A+B = (x^3 - 2x^2 + 3) + (2x^2 - x + 1)$
 $= x^3 - x + 4$
 $A-B = (x^3 - 2x^2 + 3) - (2x^2 - x + 1)$
 $= x^3 - 4x^2 + x + 2$
- (2) $A+B = (-3x + 5 + 2x^2) + (x - x^3 - 4 + 3x^2)$
 $= (2x^2 - 3x + 5) + (-x^3 + 3x^2 + x - 4)$
 $= -x^3 + 5x^2 - 2x + 1$
 $A-B = (-3x + 5 + 2x^2) - (x - x^3 - 4 + 3x^2)$
 $= (2x^2 - 3x + 5) - (-x^3 + 3x^2 + x - 4)$
 $= x^3 - x^2 - 4x + 9$

●練習 7

- (1) $A-3B$
 $= (4x^2 - xy - 2y^2) - 3(-x^2 - 3xy + y^2)$
 $= 7x^2 + 8xy - 5y^2$
- (2) $A-(B-2A) = 3A-B$
 $= 3(4x^2 - xy - 2y^2) - (-x^2 - 3xy + y^2)$
 $= 12x^2 - 3xy - 6y^2 + x^2 + 3xy - y^2$
 $= 13x^2 - 7y^2$
- (3) $2(A-3B) + 3(B-A)$
 $= -A - 3B$
 $= -(4x^2 - xy - 2y^2) - 3(-x^2 - 3xy + y^2)$
 $= -4x^2 + xy + 2y^2 + 3x^2 + 9xy - 3y^2$
 $= -x^2 + 10xy - y^2$

●練習 8

- (1) $-x^6$
- (2) (与式) $= -2a \times a^6 = -2a^7$
- (3) (与式) $= x \times 4x^2 \times (-x^5) = -4x^8$
- (4) (与式) $= 8a^2b \times \frac{1}{4}a^2b^2 = 2a^4b^3$
- (5) (与式) $= x^6y^3 \times 81x^4y^4 = 81x^{10}y^7$
- (6) (与式) $= a^2b^6c^4 \times (-8a^6b^3c^3) = -8a^8b^9c^7$

●練習 9

(1) $2a(3a-4b)=6a^2-8ab$

(2) $6x\left(xy+\frac{1}{2}y^2\right)=6x^2y+3xy^2$

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

●練習 10

(1) $(x+4y)(3x-y)$
 $=3x^2+11xy-4y^2$

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

(3) $(2x^2+xy-y^2)(3x+y)$
 $=6x^3+2x^2y+3x^2y+xy^2-3xy^2-y^3$
 $=6x^3+5x^2y-2xy^2-y^3$

(4) $(2x-5y+1)(x+y-2)$
 $=2x^2+2xy-4x-5xy-5y^2+10y+x+y-2$
 $=2x^2-3xy-5y^2-3x+11y-2$

●練習 11

(1) $4x^2+4xy+y^2$

(2) $9x^2-24xy+16y^2$

(3) x^2-4y^2

(4) $x^2-3x-10$

●問 1

(左辺) $= (ax+b)(cx+d)$
 $= ax(cx+d) + b(cx+d)$
 $= acx^2 + adx + bcx + bd$
 $= acx^2 + (ad+bc)x + bd = (\text{右辺})$

●練習 12

(1) $2x^2+7x+3$

(2) $35x^2-x-12$

(3) $12x^2+5xy-2y^2$

(4) $28x^2-29xy+6y^2$

●練習 13

(1) $(a-b-1)(a-b+3)$
 $= \{(a-b)-1\}\{(a-b)+3\}$

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

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

●練習 14

(1) $(a-b+c)^2$
 $= \{a+(-b)+c\}^2$
 $= a^2 + (-b)^2 + c^2 + 2a \cdot (-b) + 2(-b) \cdot c + 2ca$
 $= a^2 + b^2 + c^2 - 2ab - 2bc + 2ca$

(2) $(2x+3y+z)^2$
 $= (2x)^2 + (3y)^2 + z^2 + 2 \cdot 2x \cdot 3y + 2 \cdot 3y \cdot z + 2z \cdot 2x$
 $= 4x^2 + 9y^2 + z^2 + 12xy + 6yz + 4zx$

●練習 15

(1) $(a+2b)^2(a-2b)^2$
 $= \{(a+2b)(a-2b)\}^2$
 $= (a^2-4b^2)^2$
 $= a^4 - 8a^2b^2 + 16b^4$

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

●練習 16

(1) $(x+2y+3z)(x-2y-3z)$
 $= \{x+(2y+3z)\}\{x-(2y+3z)\}$
 $= x^2 - (2y+3z)^2$
 $= x^2 - (4y^2 + 12yz + 9z^2)$
 $= x^2 - 4y^2 - 9z^2 - 12yz$

(2) $(2a+b-c)(2a-b+c)$
 $= \{2a+(b-c)\}\{2a-(b-c)\}$
 $= (2a)^2 - (b-c)^2$
 $= 4a^2 - (b^2 - 2bc + c^2)$
 $= 4a^2 - b^2 - c^2 + 2bc$

●練習 17

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

$$\begin{aligned}
 &= (x^2 - 3x)(x^2 - 3x + 2) \\
 &= (x^2 - 3x)^2 + 2(x^2 - 3x) \\
 &= x^4 - 6x^3 + 9x^2 + 2x^2 - 6x \\
 &= x^4 - 6x^3 + 11x^2 - 6x
 \end{aligned}$$

$$\begin{aligned}
 (2) \quad &(x-1)(x-2)(x+3)(x+4) \\
 &= \{(x-1)(x+3)\}\{(x-2)(x+4)\} \\
 &= (x^2 + 2x - 3)(x^2 + 2x - 8) \\
 &= (x^2 + 2x)^2 - 11(x^2 + 2x) + 24 \\
 &= x^4 + 4x^3 + 4x^2 - 11x^2 - 22x + 24 \\
 &= x^4 + 4x^3 - 7x^2 - 22x + 24
 \end{aligned}$$

●練習 18

$$\begin{aligned}
 (1) \quad &4a^2b^3 + 6a^2b \\
 &= 2a^2b(2b^2 + 3) \\
 (2) \quad &x^2y^2 - 2xy^3 - xy^2 \\
 &= xy^2(x - 2y - 1) \\
 (3) \quad &(3a - b)x - (3a - b)y \\
 &= (3a - b)(x - y) \\
 (4) \quad &a(x + 2y) + 2b(x + 2y) \\
 &= (a + 2b)(x + 2y) \\
 (5) \quad &a(x - y) - b(y - x) \\
 &= a(x - y) + b(x - y) \\
 &= (a + b)(x - y) \\
 (6) \quad &a(b - 1) - b + 1 \\
 &= a(b - 1) - (b - 1) \\
 &= (a - 1)(b - 1)
 \end{aligned}$$

●練習 19

$$\begin{aligned}
 (1) \quad &x^2 + 8x + 16 = (x + 4)^2 \\
 (2) \quad &4x^2 - 20xy + 25y^2 = (2x - 5y)^2 \\
 (3) \quad &9x^2 - 16y^2 = (3x + 4y)(3x - 4y) \\
 (4) \quad &x^2 - 2x - 24 = (x + 4)(x - 6) \\
 (5) \quad &x^2 - 7xy + 6y^2 = (x - y)(x - 6y) \\
 (6) \quad &x^2 + 2xy - 15y^2 = (x - 3y)(x + 5y)
 \end{aligned}$$

●練習 20

$$\begin{aligned}
 (1) \quad &3x^2 + 5x + 2 = (x + 1)(3x + 2) \\
 (2) \quad &5x^2 + 2x - 3 = (x + 1)(5x - 3) \\
 (3) \quad &6x^2 - 13x + 6 = (2x - 3)(3x - 2)
 \end{aligned}$$

$$\begin{aligned}
 (4) \quad &2x^2 - xy - y^2 = (x - y)(2x + y) \\
 (5) \quad &4a^2 - 16ab + 15b^2 = (2a - 3b)(2a - 5b) \\
 (6) \quad &4x^2 - 5ax - 6a^2 = (x - 2a)(4x + 3a)
 \end{aligned}$$

●練習 21

$$\begin{aligned}
 (1) \quad &(x - y)^2 + 2(x - y) - 15 \\
 &= \{(x - y) - 3\}\{(x - y) + 5\} \\
 &= (x - y - 3)(x - y + 5) \\
 (2) \quad &a^2 - (b - c)^2 \\
 &= \{a + (b - c)\}\{a - (b - c)\} \\
 &= (a + b - c)(a - b + c) \\
 (3) \quad &3(x + y)^2 - 7(x + y) - 20 \\
 &= \{(x + y) - 4\}\{3(x + y) + 5\} \\
 &= (x + y - 4)(3x + 3y + 5) \\
 (4) \quad &x^4 - 3x^2 - 4 \\
 &= (x^2)^2 - 3x^2 - 4 \\
 &= (x^2 - 4)(x^2 + 1) \\
 &= (x + 2)(x - 2)(x^2 + 1) \\
 (5) \quad &x^4 - 16 \\
 &= (x^2)^2 - 4^2 = (x^2 - 4)(x^2 + 4) \\
 &= (x + 2)(x - 2)(x^2 + 4) \\
 (6) \quad &(x^2 - x)^2 - 8(x^2 - x) + 12 \\
 &= \{(x^2 - x) - 2\}\{(x^2 - x) - 6\} \\
 &= (x^2 - x - 2)(x^2 - x - 6) \\
 &= (x + 1)(x - 2)(x + 2)(x - 3)
 \end{aligned}$$

●練習 22

$$\begin{aligned}
 (1) \quad &x^2 + xy + y - 1 \\
 &= (x + 1)y + x^2 - 1 \\
 &= (x + 1)y + (x + 1)(x - 1) \\
 &= (x + 1)(x + y - 1) \\
 (2) \quad &2x^2 + 3xy + x + 3y - 1 \\
 &= (3x + 3)y + 2x^2 + x - 1 \\
 &= 3(x + 1)y + (x + 1)(2x - 1) \\
 &= (x + 1)(2x + 3y - 1) \\
 (3) \quad &x^2y - x - 4y + 2 \\
 &= (x^2 - 4)y - x + 2 \\
 &= (x + 2)(x - 2)y - (x - 2)
 \end{aligned}$$

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

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

$$(4) x^2+xz-yz-y^2$$

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

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

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

●練習 23

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

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

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

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

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

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

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

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

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

●練習 24

$$(\text{与式})=(c-b)a^2-(c^2-b^2)a+bc(c-b)$$

$$=(c-b)a^2-(c-b)(c+b)a+bc(c-b)$$

$$=(c-b)\{a^2-(c+b)a+bc\}$$

$$=(c-b)(a-b)(a-c)$$

$$=(a-b)(b-c)(c-a)$$

●演習 1

$$(1) (\text{与式})$$

$$=(x^4+6x^2+9)-4x^2$$

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

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

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

$$(2) (\text{与式})$$

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

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

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

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

p.20 問題解答

1

$$\text{解} (1) 4x^5y^5z^7 \quad (2) -\frac{2}{3}a^8b^{11}$$

2

$$\text{解} (1) (\text{与式})=x^4+x^3+x^2+x-x^3-x^2-x-1 \\ =x^4-1$$

$$(2) (\text{与式})=9a^2+4b^2+1+12ab-4b-6a \\ =9a^2+4b^2+12ab-6a-4b+1$$

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

$$(4) (\text{与式})=\{(x+1)(x-2)\}\{(x+2)(x-3)\} \\ = (x^2-x-2)(x^2-x-6) \\ = \{(x^2-x)-2\}\{(x^2-x)-6\} \\ = (x^2-x)^2-8(x^2-x)+12 \\ = x^4-2x^3-7x^2+8x+12$$

3

解 最高次の項は $2x^2 \times 5x^2 = 10x^4$ より 4次式

定数項は $4 \times (-1) = -4$

x^2 の項は $2x^2 \times (-1) + (-3x) \times x + 4 \times 5x^2 \\ = 15x^2$ より、係数は 15

4

$$\text{解} (1) (\text{与式})=(a-4)(2a-3)$$

$$(2) (\text{与式})=2(3x^2+4xy-4y^2) \\ =2(x+2y)(3x-2y)$$

$$(3) (\text{与式})=\{(a+2)+(b-1)\}\{(a+2)-(b-1)\} \\ = (a+b+1)(a-b+3)$$

$$(4) (\text{与式})=\{(x+2)-3\}\{3(x+2)+2\} \\ = (x-1)(3x+8)$$

$$(5) (\text{与式})=-(x^2-1)a+(x^2+1)(x^2-1) \\ = (x^2-1)(x^2+1-a) \\ = (x+1)(x-1)(x^2-a+1)$$

$$(6) (\text{与式})=(a+2b)^2-(a+2b)-12 \\ = \{(a+2b)-4\}\{(a+2b)+3\} \\ = (a+2b-4)(a+2b+3)$$

$$(7) \text{ (与式)} = \{(x^2 - 3x) + 2\}\{(x^2 - 3x) - 4\}$$

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

5

$$\text{解 (1) (与式)} = x^2 + 2x - (y+1)(y+3)$$

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

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

$$(2) \text{ (与式)} = 3x^2 + (4y+9)x + (y+2)(y+3)$$

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

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

$$(3) \text{ (与式)} = 2x^2 - (8y-7)x + (2y+3)(3y-5)$$

$$= (x-3y+5)(2x-2y-3)$$

$$(4) \text{ (与式)} = (b-c)a^2 - (b^2 - c^2)a + bc(b-c)$$

$$= (b-c)\{a^2 - (b+c)a + bc\}$$

$$= (b-c)(a-b)(a-c)$$

$$= -(\mathbf{a-b})(\mathbf{b-c})(\mathbf{c-a})$$

$$(5) \text{ (与式)} = (x^2 - y^2)^2 - x^2y^2$$

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

6

$$\text{解 } A+B=5x^2-2x-4 \quad \cdots\cdots\text{①}$$

$$A-B=3x^2+4x-6 \quad \cdots\cdots\text{②}$$

とおく。

$$\text{①}+\text{②} \text{ より } 2A=8x^2+2x-10$$

$$\text{よって, } A=4x^2+x-5 \quad \boxed{\mathcal{A}}=4, \quad \boxed{\mathcal{I}}=5$$

$$\text{①}-\text{②} \text{ より } 2B=2x^2-6x+2$$

$$\text{よって, } B=x^2-3x+1 \quad \boxed{\mathcal{U}}=3, \quad \boxed{\mathcal{I}}=1$$

$$2A-B=8x^2+2x-10-(x^2-3x+1)$$

$$=7x^2+5x-11 \quad \boxed{\mathcal{O}}=7, \quad \boxed{\mathcal{U}}=5, \quad \boxed{\mathcal{K}\mathcal{U}}=11$$

●演習 1

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

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

$$= x^3 - 6x^2 + 12x - 8$$

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

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

$$= 8x^3 + 12x^2y + 6xy^2 + y^3$$

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

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

$$= 27a^3 - 54a^2b + 36ab^2 - 8b^3$$

●問 1

$$(a+b)(a^2-ab+b^2)$$

$$= a^3 - a^2b + ab^2 + a^2b - ab^2 + b^3$$

$$= a^3 + b^3$$

$$(a-b)(a^2+ab+b^2)$$

$$= a^3 + a^2b + ab^2 - a^2b - ab^2 - b^3$$

$$= a^3 - b^3$$

●演習 2

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

$$= x^3 + 3^3 = x^3 + 27$$

$$(2) \text{ (与式)} = (2x-y)\{(2x)^2+2x \cdot y+y^2\}$$

$$= (2x)^3 - y^3 = 8x^3 - y^3$$

●演習 3

$$(1) \text{ (与式)} = x^3 + 4^3$$

$$= (x+4)(x^2-4x+16)$$

$$(2) \text{ (与式)} = x^3 - 1^3$$

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

$$(3) \text{ (与式)} = (2x)^3 + (5y)^3$$

$$= (2x+5y)(4x^2-10xy+25y^2)$$

$$(4) \text{ (与式)} = 2(x^3-8y^3)$$

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