

1 次の式を計算し、次数と係数を求めよ。

(1) $(-2a^2bc^3) \times 5a^3b^4c^2$

与式 $= \{(-2) \times 5\} \times a^{2+3} \times b^{1+4} \times c^{3+2} = -10a^5b^5c^5$

次数 13 係数 -10

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

(与式 $= (-1)^2 a^4 b^2 \cdot a^3 b^2 = 1 \cdot a^{4+3} b^{2+2} = a^7 b^4$

次数 11 係数 1

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

与式 $= 2A - 3\{A - (B + C)\} = (2 - 3)A + 3B + 3C = -A + 3B + 3C$
 $= -(2x + y + z) + 3(x + 2y + z) + 3(x + y + 2z)$
 $= (-2 + 3 + 3)x + (-1 + 6 + 3)y + (-1 + 3 + 6)z$
 $= 4x + 8y + 8z$

(2) $A=2x^2+xy-3z$, $B=-3x^2+2xy+z$, $C=x^2-3xy+2z$ であるとき,
 $2A-(B+2C)$ を計算せよ。

$2A - (B + 2C) = 2A - B - 2C$
 $= 2(2x^2 + xy - 3z) - (-3x^2 + 2xy + z) - 2(x^2 - 3xy + 2z)$
 $= 4x^2 + 2xy - 6z + 3x^2 - 2xy - z - 2x^2 + 6xy - 4z$
 $= (4 + 3 - 2)x^2 + (2 - 2 + 6)xy + (-6 - 1 - 4)z$
 $= 5x^2 + 6xy - 11z$

3 次の式を展開せよ。

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

$(x-3y)^2 = x^2 - 2 \cdot x \cdot 3y + (3y)^2 = x^2 - 6xy + 9y^2$

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

$(4a-5b)(4a+5b) = (4a)^2 - (5b)^2 = 16a^2 - 25b^2$

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

$(2x-3)(4x+1) = 2 \cdot 4x^2 + \{2 \cdot 1 + (-3) \cdot 4\}x + (-3) \cdot 1 = 8x^2 - 10x - 3$

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

$(5a-4b)(2a-3b) = 5 \cdot 2a^2 + \{5 \cdot (-3) + (-4) \cdot 2\}ab + (-4) \cdot (-3)b^2$
 $= 10a^2 - 23ab + 12b^2$

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

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

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

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

(7) $(2x-3y+4z)^2$

与式 $= \{(2x-3y)+4z\}^2 = (2x-3y)^2 + 2(2x-3y) \cdot 4z + (4z)^2$
 $= (4x^2 - 12xy + 9y^2) + 16xz - 24yz + 16z^2$
 $= 4x^2 + 9y^2 + 16z^2 - 12xy - 24yz + 16zx$

別解 与式 $= (2x)^2 + (-3y)^2 + (4z)^2 + 2 \cdot 2x \cdot (-3y) + 2 \cdot (-3y) \cdot 4z + 2 \cdot 4z \cdot 2x$
 $= 4x^2 + 9y^2 + 16z^2 - 12xy - 24yz + 16zx$

4 次の式を因数分解せよ。

(1) $25x^2-20xy+4y^2$

$25x^2 - 20xy + 4y^2 = (5x)^2 - 2 \cdot 5x \cdot 2y + (2y)^2 = (5x-2y)^2$

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

$3x^2 - 12xy + 12y^2 = 3(x^2 - 4xy + 4y^2) = 3\{x^2 - 2 \cdot x \cdot 2y + (2y)^2\} = 3(x-2y)^2$

(3) $12a^2b^2-27$

$12a^2b^2 - 27 = 3(4a^2b^2 - 9) = 3\{(2ab)^2 - 3^2\} = 3(2ab+3)(2ab-3)$

(4) $6x^2-x-2$

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

2	×	1	→	3
3		-2	→	-4
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6		-2		-1

(5) $10x^2-31x+15$

$10x^2 - 31x + 15 = (2x-5)(5x-3)$

2	×	-5	→	-25
5		-3	→	-6
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10		15		-31

(6) $8a^2b+18bc^2-24abc$

$8a^2b + 18bc^2 - 24abc = 2b(4a^2 + 9c^2 - 12ac) = 2b\{(2a)^2 - 2 \cdot 2a \cdot 3c + (3c)^2\}$
 $= 2b(2a-3c)^2$

(7) $8x^2y^2-18$

$8x^2y^2 - 18 = 2(4x^2y^2 - 9) = 2\{(2xy)^2 - 3^2\} = 2(2xy+3)(2xy-3)$

(8) $6x^2-xy-12y^2$

$6x^2 - xy - 12y^2 = (2x-3y)(3x+4y)$

2	×	-3y	→	-9y
3		4y	→	8y
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6		-12y^2		-y