

(3) 乗法公式

◆乗法公式

$$\left\{ \begin{array}{l} \textcircled{1} (x+a)(x+b) = x^2 + (a+b)x + ab \\ \textcircled{2} (x+a)^2 = x^2 + 2ax + a^2 \\ \textcircled{3} (x-a)^2 = x^2 - 2ax + a^2 \\ \textcircled{4} (x+a)(x-a) = x^2 - a^2 \end{array} \right.$$

$$\left\{ \begin{array}{l} \textcircled{1}' (ax+by)(ax+cy) = (ax)^2 + (by+cy) \times ax + bcy^2 \\ \textcircled{2}' (\textcircled{ax} \pm \textcircled{by})^2 = (\textcircled{ax})^2 + 2 \times (\pm \textcircled{by}) \times \textcircled{ax} + (\textcircled{by})^2 \end{array} \right.$$

(例1) 次の式を展開しなさい。① $(x+a)(x+b) = x^2 + (a+b)x + ab$ の利用

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

$$= x^2 + (3+7)x + 3 \times 7$$

$$= x^2 + 10x + 21$$

$$(2) (x-0.5)(x-0.8)$$

$$= x^2 + (-0.5-0.8)x - 0.5 \times (-0.8)$$

$$= x^2 - 1.3x + 0.4$$

$$(3) \left(x - \frac{1}{2}\right) \left(x + \frac{1}{3}\right)$$

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

$$= x^2 - \frac{1}{6}x - \frac{1}{6}$$

$$(4) (a-6y)(a+5y)$$

$$= a^2 + (-6y+5y)a - 6y \times 5y$$

$$= a^2 - ay - 30y^2$$

$$(5) (3t-5)(3t-9)$$

$$= (3t)^2 + (-5-9) \times 3t - 5 \times (-9)$$

$$= 9t^2 - 42t + 45$$

$$(6) (2a-5y)(2a+12y)$$

$$= (2a)^2 + (-5y+12y) \times 2a - 5y \times 12y$$

$$= 4a^2 + 14ay - 60y^2$$

(例2) 次の式を展開しなさい。

②③ $(x \pm a)^2 = x^2 \pm 2ax + a^2$ の利用

$$\begin{aligned}(1) (a+5)^2 \\&= a^2 + 2 \times 5 \times a + 5^2 \\&= a^2 + 10a + 25\end{aligned}$$

$$\begin{aligned}(2) (x-4y)^2 \\&= x^2 + 2 \times (-4y) \times x + (-4y)^2 \\&= x^2 - 8xy + 16y^2\end{aligned}$$

$$\begin{aligned}(3) (3a-5)^2 \\&= (3a)^2 - 2 \times (-5) \times 3a + (-5)^2 \\&= 9a^2 + 30a + 25\end{aligned}$$

$$\begin{aligned}(4) (5a+4b)^2 \\&= (5a)^2 + 2 \times 4b \times 5a + (4b)^2 \\&= 25a^2 + 40ab + 16b^2\end{aligned}$$

$$\begin{aligned}(5) \left(2x - \frac{1}{4}\right)^2 \\&= (2x)^2 + 2 \times \left(-\frac{1}{4}\right) \times 2x + \left(-\frac{1}{4}\right)^2 \\&= 4x^2 - x + \frac{1}{16}\end{aligned}$$

$$\begin{aligned}(6) (-a+6b)^2 \\&= (-a)^2 + 2 \times 6b \times (-a) + (6b)^2 \\&= a^2 - 12ab + 36b^2\end{aligned}$$

(例3) 次の式を展開しなさい。

④ $(x+a)(x-a) = x^2 - a^2$ の利用

$$\begin{aligned}(1) (a+10)(a-10) \\&= a^2 - 10^2 \\&= a^2 - 100\end{aligned}$$

$$\begin{aligned}(2) (x-0.4)(x+0.4) \\&= x^2 - 0.4^2 \\&= x^2 - 0.16\end{aligned}$$

$$\begin{aligned}(3) (7a+bc)(7a-bc) \\&= (7a)^2 - (bc)^2 \\&= 49a^2 - b^2c^2\end{aligned}$$

$$\begin{aligned}(4) (14a+13b)(14a-13b) \\&= (14a)^2 - (13b)^2 \\&= 196a^2 - 169b^2\end{aligned}$$

$$\begin{aligned}(5) \left(1 - \frac{2}{3}u\right)\left(1 + \frac{2}{3}u\right) \\&= 1^2 - \left(\frac{2}{3}u\right)^2 \\&= 1 - \frac{4}{9}u^2\end{aligned}$$

$$\begin{aligned}(6) (\underline{-x-15y})(\underline{x-15y}) \\&= (\underline{-15y-x})(\underline{-15y+x}) \\&= (-15y)^2 - x^2 \\&= 225y^2 - x^2\end{aligned}$$