

展開と因数分解 [いろいろな因数分解(2)]

<演習問題>

次の式を因数分解せよ。

(1) $(x + 1)^2 + 8(x + 1) + 12$

(2) $(x - 2)^2 + 7(x - 2) + 6$

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

(4) $(x + y)^2 + 5(x + y) + 6$

(5) $(x + y)^2 + 6(x + y) + 9$

(6) $(x - 2y)^2 - 8(x - 2y) + 16$

(7) $(x - 3)^2 - 16$

(8) $(4x + 3)^2 - (x - 1)^2$

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

(10) $xy + x + y + 1$

(11) $xy + 2x + 3y + 6$

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

(13) $xy - 3x - 2y + 6$

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次の式を因数分解せよ。

(1) $(x+1)^2 + 8(x+1) + 12$

$x+1 = M$ とおくと

$$\begin{aligned}(x+1)^2 + 8(x+1) + 12 &= M^2 + 8M + 12 \\ &= (M+2)(M+6) \\ &= (x+1+2)(x+1+6) \\ &= (x+3)(x+7)\end{aligned}$$

(2) $(x-2)^2 + 7(x-2) + 6$

$x-2 = M$ とおくと

$$\begin{aligned}(x-2)^2 + 7(x-2) + 6 &= M^2 + 7M + 6 \\ &= (M+1)(M+6) \\ &= (x-2+1)(x-2+6) \\ &= (x-1)(x+4)\end{aligned}$$

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

$x-3 = M$ とおくと

$$\begin{aligned}(x-3)^2 - 5(x-3) + 4 &= M^2 - 5M + 4 \\ &= (M-1)(M-4) \\ &= (x-3-1)(x-3-4) \\ &= (x-4)(x-7)\end{aligned}$$

(4) $(x+y)^2 + 5(x+y) + 6$

$x+y = M$ とおくと

$$\begin{aligned}(x+y)^2 + 5(x+y) + 6 &= M^2 + 5M + 6 \\ &= (M+2)(M+3) \\ &= (x+y+2)(x+y+3)\end{aligned}$$

(5) $(x+y)^2 + 6(x+y) + 9$

$x+y = M$ とおくと

$$\begin{aligned}(x+y)^2 + 6(x+y) + 9 &= M^2 + 6M + 9 \\ &= (M+3)^2 \\ &= (x+y+3)^2\end{aligned}$$

(6) $(x-2y)^2 - 8(x-2y) + 16$

$x-2y = M$ とおくと

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

(7) $(x-3)^2 - 16$

$x-3 = M$ とおくと

$$\begin{aligned}(x-3)^2 - 16 &= M^2 - 16 \\ &= (M+4)(M-4) \\ &= (x-3+4)(x-3-4) \\ &= (x+1)(x-7)\end{aligned}$$

(8) $(4x+3)^2 - (x-1)^2$

$4x+3 = M, x-1 = N$ とおくと

$$\begin{aligned}(4x+3)^2 - (x-1)^2 &= M^2 - N^2 \\ &= (M+N)(M-N) \\ &= (4x+3+x-1)(4x+3-x+1) \\ &= (5x+2)(3x+4)\end{aligned}$$

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

$3x+y = M, 2x-3y = N$ とおくと

$$\begin{aligned}(3x+y)^2 - (2x-3y)^2 &= M^2 - N^2 \\ &= (M+N)(M-N) \\ &= (3x+y+2x-3y)(3x+y-2x+3y) \\ &= (5x-2y)(x+4y)\end{aligned}$$

(10) $xy + x + y + 1$

$$\begin{aligned}xy + x + y + 1 &= x(y+1) + (y+1) \\ &= (x+1)(y+1)\end{aligned}$$

(11) $xy + 2x + 3y + 6$

$$\begin{aligned}xy + 2x + 3y + 6 &= x(y+2) + 3(y+2) \\ &= (x+3)(y+2)\end{aligned}$$

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

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

(13) $xy - 3x - 2y + 6$

$$\begin{aligned}xy - 3x - 2y + 6 &= x(y-3) - 2(y-3) \\ &= (x-2)(y-3)\end{aligned}$$