

# 基本解法チェックテスト～KCT48～

## 1. 数と式① ～因数分解, 有理数無理数～

1 A (1)[中央大], (2)[横浜市立大]

次の式を因数分解せよ。

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

(2)  $a^4 + b^4 + c^4 - 2a^2b^2 - 2a^2c^2 - 2b^2c^2$

2 A [防衛大]

$\frac{1}{1+\sqrt{2}-\sqrt{5}} - \frac{1}{1+\sqrt{2}+\sqrt{5}}$  の値を求めよ。

3 A [防衛医科大]

$\sqrt{9+4\sqrt{5}}x + (1+3\sqrt{5})y = 8+9\sqrt{5}$  を満たす整数  $x, y$  の組を求めよ。

1	(1)	
	(2)	
2		3

1 A 因数分解(1つの文字に注目)

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

$$\begin{aligned}
 (2) \quad & a^4 + b^4 + c^4 - 2a^2b^2 - 2a^2c^2 - 2b^2c^2 \\
 & = a^4 - 2(b^2 + c^2)a^2 + b^4 - 2b^2c^2 + c^4 \\
 & = a^4 - 2(b^2 + c^2)a^2 + (b^2 - c^2)^2 \\
 & = a^4 - \{(b+c)^2 + (b-c)^2\}a^2 + (b+c)^2(b-c)^2 \\
 & = \{a^2 - (b+c)^2\}\{a^2 - (b-c)^2\} \\
 & = \{a + (b+c)\}\{a - (b+c)\}\{a + (b-c)\}\{a - (b-c)\} \\
 & = \boxed{(a+b+c)(a-b-c)(a+b-c)(a-b+c)}
 \end{aligned}$$

2 A 有理数・無理数

$$\begin{aligned}
 \frac{1}{1+\sqrt{2}-\sqrt{5}} - \frac{1}{1+\sqrt{2}+\sqrt{5}} &= \frac{(1+\sqrt{2}+\sqrt{5}) - (1+\sqrt{2}-\sqrt{5})}{(1+\sqrt{2}-\sqrt{5})(1+\sqrt{2}+\sqrt{5})} \\
 &= \frac{2\sqrt{5}}{(1+\sqrt{2})^2 - (\sqrt{5})^2} \\
 &= \frac{2\sqrt{5}}{2(\sqrt{2}-1)} = \frac{\sqrt{5}}{\sqrt{2}-1} \\
 &= \frac{\sqrt{5}(\sqrt{2}+1)}{(\sqrt{2}-1)(\sqrt{2}+1)} \\
 &= \boxed{\sqrt{10} + \sqrt{5}}
 \end{aligned}$$

3 A 有理数・無理数

$$\begin{aligned}
 \sqrt{9+4\sqrt{5}} &= \sqrt{9+2\sqrt{20}} \\
 &= \sqrt{5} + \sqrt{4} \\
 &= \sqrt{5} + 2
 \end{aligned}$$

よって, 与式は

$$\begin{aligned}
 (\sqrt{5} + 2)x + (1 + 3\sqrt{5})y &= 8 + 9\sqrt{5} \\
 (2x + y) + (x + 3y)\sqrt{5} &= 8 + 9\sqrt{5}
 \end{aligned}$$

となる。  $2x + y$ ,  $x + 3y$  は整数(有理数),  $\sqrt{5}$  は無理数であるから

$$2x + y = 8, \quad x + 3y = 9$$

これを解いて  $\boxed{x=3, y=2}$