

第3章 2 「行列式の性質」 第3回

解答

1. (1) 7 (2) 2

2. (1) -21 (2) 9

解説

$$\begin{aligned}
 & \mathbf{1. (1)} \quad \begin{vmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 2 & 1 \\ 1 & 0 & 2 & 1 \\ 2 & 2 & 0 & 1 \end{vmatrix} \xrightarrow{\substack{3\text{行}-1\text{行}\times 1 \\ 4\text{行}-1\text{行}\times 2}} \begin{vmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 2 & 1 \\ 0 & -1 & 1 & 1 \\ 0 & 0 & -2 & 1 \end{vmatrix} \xrightarrow{\substack{\text{教科書} \\ 91\text{ページ} \\ \text{例題 3}}} 1 \begin{vmatrix} 1 & 2 & 1 \\ -1 & 1 & 1 \\ 0 & -2 & 1 \end{vmatrix} \\
 & \quad \xrightarrow{2\text{行}+1\text{行}\times 1} \begin{vmatrix} 1 & 2 & 1 \\ 0 & 3 & 2 \\ 0 & -2 & 1 \end{vmatrix} \xrightarrow{\substack{\text{教科書} \\ 91\text{ページ} \\ \text{例題 3}}} 1 \begin{vmatrix} 3 & 2 \\ -2 & 1 \end{vmatrix} = 3 \times 1 - 2 \times (-2) = 7
 \end{aligned}$$

$$\begin{aligned}
 & \mathbf{(2)} \quad \begin{vmatrix} 2 & 0 & 2 & 3 \\ 0 & 1 & 3 & 2 \\ 1 & 1 & 2 & 2 \\ 2 & 1 & 3 & 3 \end{vmatrix} \xrightarrow{1\text{行}\& 3\text{行を交換}} \begin{vmatrix} 1 & 1 & 2 & 2 \\ 0 & 1 & 3 & 2 \\ 2 & 0 & 2 & 3 \\ 2 & 1 & 3 & 3 \end{vmatrix} \xrightarrow{\substack{3\text{行}-1\text{行}\times 2 \\ 4\text{行}-1\text{行}\times 2}} \begin{vmatrix} 1 & 1 & 2 & 2 \\ 0 & 1 & 3 & 2 \\ 0 & -2 & -2 & -1 \\ 0 & -1 & -1 & -1 \end{vmatrix} \\
 & \quad \xrightarrow{\substack{\text{教科書} \\ 91\text{ページ} \\ \text{例題 3}}} -1 \begin{vmatrix} 1 & 3 & 2 \\ -2 & -2 & -1 \\ -1 & -1 & -1 \end{vmatrix} \xrightarrow{\substack{2\text{行}+1\text{行}\times 2 \\ 3\text{行}+1\text{行}\times 1}} \begin{vmatrix} 1 & 3 & 2 \\ 0 & 4 & 3 \\ 0 & 2 & 1 \end{vmatrix} \xrightarrow{\substack{\text{教科書} \\ 91\text{ページ} \\ \text{例題 3}}} -1 \begin{vmatrix} 4 & 3 \\ 2 & 1 \end{vmatrix} = -(4 \times 1 - 3 \times 2) = 2
 \end{aligned}$$

$$\begin{aligned}
 & \mathbf{2. (1)} \quad \begin{vmatrix} 3 & 2 & 0 & 1 \\ 4 & 3 & 2 & 2 \\ 7 & 7 & 5 & 3 \\ 5 & 2 & -2 & 4 \end{vmatrix} \xrightarrow{1\text{列}\& 4\text{列を交換}} \begin{vmatrix} 1 & 2 & 0 & 3 \\ 2 & 3 & 2 & 4 \\ 3 & 7 & 5 & 7 \\ 4 & 2 & -2 & 5 \end{vmatrix} \xrightarrow{\substack{2\text{列}-1\text{列}\times 2 \\ 4\text{列}-1\text{列}\times 3}} \begin{vmatrix} 1 & 0 & 0 & 0 \\ 2 & -1 & 2 & -2 \\ 3 & 1 & 5 & -2 \\ 4 & -6 & -2 & -7 \end{vmatrix} \\
 & \quad \xrightarrow{\substack{\text{教科書} \\ 96\text{ページ} \\ \text{例 4の上}}} -1 \begin{vmatrix} -1 & 2 & -2 \\ 1 & 5 & -2 \\ -6 & -2 & -7 \end{vmatrix} \xrightarrow{\substack{2\text{列}+1\text{列}\times 2 \\ 3\text{列}-1\text{列}\times 2}} \begin{vmatrix} -1 & 0 & 0 \\ 1 & 7 & -4 \\ -6 & -14 & 5 \end{vmatrix} \xrightarrow{\substack{\text{教科書} \\ 96\text{ページ} \\ \text{例 4の上}}} -(-1) \begin{vmatrix} 7 & -4 \\ -14 & 5 \end{vmatrix} \\
 & \quad = 7 \times 5 - (-4) \times (-14) = -21
 \end{aligned}$$

$$\begin{aligned}
 & \mathbf{(2)} \quad \begin{vmatrix} 3 & 2 & 1 & 3 \\ 5 & 3 & 0 & 1 \\ 2 & 2 & 4 & 1 \\ 6 & 4 & 1 & 4 \end{vmatrix} \xrightarrow{1\text{列}\& 3\text{列を交換}} \begin{vmatrix} 1 & 2 & 3 & 3 \\ 0 & 3 & 5 & 1 \\ 4 & 2 & 2 & 1 \\ 1 & 4 & 6 & 4 \end{vmatrix} \xrightarrow{\substack{3\text{行}-1\text{行}\times 4 \\ 4\text{行}-1\text{行}\times 1}} \begin{vmatrix} 1 & 2 & 3 & 3 \\ 0 & 3 & 5 & 1 \\ 0 & -6 & -10 & -11 \\ 0 & 2 & 3 & 1 \end{vmatrix} \\
 & \quad \xrightarrow{\substack{\text{教科書} \\ 91\text{ページ} \\ \text{例題 3}}} -1 \begin{vmatrix} 3 & 5 & 1 \\ -6 & -10 & -11 \\ 2 & 3 & 1 \end{vmatrix} \xrightarrow{1\text{列}\& 3\text{列を交換}} \begin{vmatrix} 1 & 5 & 3 \\ -11 & -10 & -6 \\ 1 & 3 & 2 \end{vmatrix} \xrightarrow{\substack{2\text{行}+1\text{行}\times 11 \\ 3\text{行}-1\text{行}\times 1}} \begin{vmatrix} 1 & 5 & 3 \\ 0 & 45 & 27 \\ 0 & -2 & -1 \end{vmatrix} \\
 & \quad \xrightarrow{\substack{\text{教科書} \\ 91\text{ページ} \\ \text{例題 3}}} 1 \begin{vmatrix} 45 & 27 \\ -2 & -1 \end{vmatrix} = 45 \times (-1) - 27 \times (-2) = 9
 \end{aligned}$$