

7 行列式の展開とクラメルの公式

問題 7.1. (1) 17. (2) -180 . (3) -324 . (4) 30. (5) 288. (6) 57. (7) -70 . (8) -434 . (9) $-15x + 82$.
(10) $20x + 31$. (11) $x^4 - x^2 + 2x - 2 = (x - 1)(x^3 + x^2 + 2)$. (12) $x^2y^2 - x^2 - 9xy - y^2 + 4x + 4y + 9$.

問題 7.2.

$$\begin{aligned} (1) \frac{1}{24} \begin{pmatrix} -7 & 11 & -1 \\ -1 & 5 & -7 \\ 11 & -7 & 5 \end{pmatrix} & (2) \frac{1}{21} \begin{pmatrix} -2 & -7 & 1 \\ 11 & 7 & 5 \\ 5 & 7 & 8 \end{pmatrix} & (3) \frac{1}{5} \begin{pmatrix} -5 & 0 & 5 \\ 0 & 3 & -1 \\ 5 & -1 & -3 \end{pmatrix} \\ (4) \frac{1}{6} \begin{pmatrix} 6 & -2 & -2 \\ 0 & 4 & -2 \\ -6 & -1 & 5 \end{pmatrix} & (5) \frac{1}{20} \begin{pmatrix} 5 & -1 & 14 \\ 5 & -5 & 10 \\ -5 & 9 & -26 \end{pmatrix} & (6) \frac{1}{18} \begin{pmatrix} 6 & -3 & 3 \\ -44 & 37 & -19 \\ -46 & 35 & -17 \end{pmatrix} \\ (7) \frac{1}{25} \begin{pmatrix} 9 & 4 & 11 \\ 11 & -9 & -6 \\ -1 & -6 & -4 \end{pmatrix} & (8) \frac{1}{21} \begin{pmatrix} -12 & -5 & 8 \\ -24 & -3 & 9 \\ -3 & 4 & 2 \end{pmatrix} & (9) \frac{1}{3} \begin{pmatrix} 2 & -2 & -1 \\ -7 & 13 & -1 \\ 2 & -5 & 2 \end{pmatrix} \\ (10) \frac{1}{25} \begin{pmatrix} 3 & 2 & -1 \\ -31 & 21 & 27 \\ 23 & -18 & -16 \end{pmatrix} & (11) \frac{1}{9} \begin{pmatrix} -1 & -12 & 19 \\ 1 & -6 & 8 \\ 2 & 15 & -20 \end{pmatrix} & (12) \frac{1}{18} \begin{pmatrix} -22 & 26 & -10 \\ 26 & -25 & 11 \\ 10 & -11 & 7 \end{pmatrix} \end{aligned}$$

問題 7.3.

$$\begin{aligned} (1) x = -\frac{8}{5}, y = 0, z = \frac{9}{5}. & (2) x = \frac{1}{7}, y = -\frac{43}{7}, z = -\frac{23}{7}. & (3) x = \frac{3}{4}, y = -\frac{9}{4}, z = -\frac{25}{4}. \\ (4) x = -\frac{5}{7}, y = -\frac{13}{7}, z = -\frac{1}{7}. & (5) x = 2, y = 4, z = 5. & (6) x = -\frac{1}{4}, y = 4, z = \frac{7}{4}. \\ (7) x = \frac{11}{4}, y = \frac{3}{2}, z = \frac{19}{4}. & (8) x = 10, y = 3, z = -16. & (9) x = -\frac{4}{3}, y = \frac{7}{3}, z = \frac{22}{3}. \\ (10) x = -\frac{20}{3}, y = \frac{8}{3}, z = \frac{35}{3}. & (11) x = -1, y = 4, z = 1. & (12) x = \frac{25}{7}, y = \frac{11}{7}, z = -\frac{5}{7}. \end{aligned}$$

問題 7.4. (1) $a^4 - 28a^2 + 48a = a(a - 4)(a - 2)(a + 6)$. (2) $x^2y^2 - 9x^2 - 15xy - 4y^2 + 30x + 20y - 23$.
(3) $x^4 + 2x^3 - 2x^2 + 8 = (x + 2)^2(x^2 - 2x + 2)$. (4) $x^4 - 17x^2 + x + 12 = (x - 4)(x^3 + 4x^2 - x - 3)$.
(5) 33. (6) -35 .

問題 7.5.

$$\begin{aligned} (1) \frac{1}{32} \begin{pmatrix} -11 & 5 & 13 & -3 \\ 5 & -11 & -3 & 13 \\ 13 & -3 & 5 & -11 \\ -3 & 13 & -11 & 5 \end{pmatrix} & (2) \frac{1}{40} \begin{pmatrix} 5 & 5 & 5 & 5 \\ 1 & -7 & -15 & 17 \\ 8 & -16 & 0 & 16 \\ 7 & 31 & 15 & -41 \end{pmatrix} \\ (3) \frac{1}{6} \begin{pmatrix} -33 & -8 & -11 & 34 \\ -27 & -8 & -11 & 28 \\ -30 & -6 & -12 & 30 \\ -9 & -2 & -5 & 10 \end{pmatrix} & (4) \frac{1}{24} \begin{pmatrix} 64 & -3 & -10 & -33 \\ 24 & 3 & -6 & -15 \\ -72 & 6 & 12 & 42 \\ -32 & -3 & 14 & 15 \end{pmatrix} \end{aligned}$$

問題 7.6.

$$\begin{aligned} (1) x_1 = 4, x_2 = -6, x_3 = 4, x_4 = 1. & (2) x_1 = 20, x_2 = 2, x_3 = 12, x_4 = -23. \\ (3) x_1 = \frac{47}{4}, x_2 = \frac{29}{8}, x_3 = -6, x_4 = \frac{19}{4}. & (4) x_1 = 60, x_2 = -12, x_3 = -\frac{55}{2}, x_4 = -\frac{117}{2}. \\ (5) x = 3a + 22, y = -2a - 27, z = a + 20. & (6) x = -14a + 3, y = 19a - 4, z = -7a + 2. \end{aligned}$$