

代数学幾何学 (A/B) 計算演習 [問題] (2009/12/24)

問. n 次の多項式からなる線型空間 $(\{\sum_{i=0}^n c_i x^i \mid c_i (i=0..n) \in \mathbf{R}\})$ の、次の二組の基底 E, F に対して、 E から F への基底の変換行列を求めなさい。

Q.1

$$\begin{aligned} E &= \langle x + 2x^2, 1, -2 - x^2 \rangle \\ F &= \langle x^2, 2 - x - 3x^2, 1 - x - 3x^2 \rangle \end{aligned}$$

Q.9

$$\begin{aligned} E &= \langle x^2, -x, 1 - 2x + 2x^2 \rangle \\ F &= \langle 2 - 5x + 2x^2, 2 - 5x + x^2, -1 + 2x - x^2 \rangle \end{aligned}$$

Q.2

$$\begin{aligned} E &= \langle x - x^2, -2x + 3x^2, 1 \rangle \\ F &= \langle 2 - 7x + 8x^2, -1 + 2x - 2x^2, -3 + 7x - 7x^2 \rangle \end{aligned}$$

Q.10

$$\begin{aligned} E &= \langle 3 - 2x + 2x^2, 2 - x + x^2, 4 + x^2 \rangle \\ F &= \langle -2 - 3x + x^2, -1 + 9x - 5x^2, 2 + x \rangle \end{aligned}$$

Q.3

$$\begin{aligned} E &= \langle -1 - x - x^2, 1 + x^2, 1 - x \rangle \\ F &= \langle 1 + x + x^2, 2 + x^2, x + x^2 \rangle \end{aligned}$$

Q.11

$$\begin{aligned} E &= \langle x^2, -x + 2x^2, -1 - 3x + 3x^2 \rangle \\ F &= \langle 2 + 4x + x^2, -1 - 3x + 2x^2, 3 + 8x - 3x^2 \rangle \end{aligned}$$

Q.4

$$\begin{aligned} E &= \langle -1 + 3x + 2x^2, 3x + 2x^2, 2x + x^2 \rangle \\ F &= \langle -5x - 3x^2, -1 + x + x^2, 1 - 4x - 3x^2 \rangle \end{aligned}$$

Q.12

$$\begin{aligned} E &= \langle 2 - 2x + x^2, -1, -1 - x \rangle \\ F &= \langle 3 + 4x - x^2, 2 - 7x + 3x^2, 1 + 3x - x^2 \rangle \end{aligned}$$

Q.5

$$\begin{aligned} E &= \langle x + x^2, 1 + 2x + x^2, 1 + 3x + 3x^2 \rangle \\ F &= \langle 4 + 11x + 9x^2, -2 - 5x - 4x^2, -1 - x \rangle \end{aligned}$$

Q.13

$$\begin{aligned} E &= \langle -4 - 2x + x^2, -1 + x^2, -2 - x + x^2 \rangle \\ F &= \langle 6 + 3x - 2x^2, 20 + 9x - 7x^2, 23 + 11x - 8x^2 \rangle \end{aligned}$$

Q.6

$$\begin{aligned} E &= \langle -2 - x + x^2, -1 + x^2, -2 - 2x + x^2 \rangle \\ F &= \langle x, 1 + x, 2x + x^2 \rangle \end{aligned}$$

Q.14

$$\begin{aligned} E &= \langle -3x - x^2, -2x - x^2, 1 + 5x + 2x^2 \rangle \\ F &= \langle -2 - 13x - 5x^2, 1 + 5x + 2x^2, -1 - 3x - x^2 \rangle \end{aligned}$$

Q.7

$$\begin{aligned} E &= \langle x + x^2, 1 + x + x^2, -1 - 2x - x^2 \rangle \\ F &= \langle 2 + 3x + 3x^2, 1 + 2x + 2x^2, 2 + 3x + 2x^2 \rangle \end{aligned}$$

Q.15

$$\begin{aligned} E &= \langle -2 - x - 2x^2, 2 + x + x^2, -3 - x - x^2 \rangle \\ F &= \langle -16 - 7x - 8x^2, 9 + 4x + 5x^2, 2 + x + x^2 \rangle \end{aligned}$$

Q.8

$$\begin{aligned} E &= \langle 1, -1 + x - x^2, 2 - x \rangle \\ F &= \langle 1 - x^2, -1 + 2x^2, -1 + x \rangle \end{aligned}$$

Q.16

$$\begin{aligned} E &= \langle 1, -x, -1 + x^2 \rangle \\ F &= \langle 1 - x - x^2, 1 + 3x, -1 - 2x \rangle \end{aligned}$$

代数学幾何学 (A/B) 計算演習 [解答] (2009/12/24)

A.1

$$\begin{pmatrix} 0 & -1 & -1 \\ -2 & 4 & 3 \\ -1 & 1 & 1 \end{pmatrix}$$

A.2

$$\begin{pmatrix} -5 & 2 & 7 \\ 1 & 0 & 0 \\ 2 & -1 & -3 \end{pmatrix}$$

A.3

$$\begin{pmatrix} -1 & -1 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & -1 \end{pmatrix}$$

A.4

$$\begin{pmatrix} 0 & 1 & -1 \\ -1 & 0 & -1 \\ -1 & -1 & 1 \end{pmatrix}$$

A.5

$$\begin{pmatrix} 1 & 0 & 1 \\ 2 & -1 & -1 \\ 2 & -1 & 0 \end{pmatrix}$$

A.6

$$\begin{pmatrix} 1 & -1 & 0 \\ 0 & 1 & 2 \\ -1 & 0 & -1 \end{pmatrix}$$

A.7

$$\begin{pmatrix} 1 & 1 & 0 \\ 2 & 1 & 1 \\ 0 & 0 & -1 \end{pmatrix}$$

A.8

$$\begin{pmatrix} 0 & 1 & 1 \\ 1 & -2 & 0 \\ 1 & -2 & -1 \end{pmatrix}$$

A.9

$$\begin{pmatrix} -2 & -3 & 1 \\ 1 & 1 & 0 \\ 2 & 2 & -1 \end{pmatrix}$$

A.10

$$\begin{pmatrix} 0 & -1 & 0 \\ 3 & -7 & -1 \\ -2 & 4 & 1 \end{pmatrix}$$

A.11

$$\begin{pmatrix} 3 & -1 & 4 \\ 2 & 0 & 1 \\ -2 & 1 & -3 \end{pmatrix}$$

A.12

$$\begin{pmatrix} -1 & 3 & -1 \\ -3 & 3 & -2 \\ -2 & 1 & -1 \end{pmatrix}$$

A.13

$$\begin{pmatrix} -1 & -4 & -4 \\ 0 & -2 & -1 \\ -1 & -1 & -3 \end{pmatrix}$$

A.14

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & -1 \\ -2 & 1 & -1 \end{pmatrix}$$

A.15

$$\begin{pmatrix} 1 & -1 & 0 \\ -4 & 2 & 1 \\ 2 & -1 & 0 \end{pmatrix}$$

A.16

$$\begin{pmatrix} 0 & 1 & -1 \\ 1 & -3 & 2 \\ -1 & 0 & 0 \end{pmatrix}$$