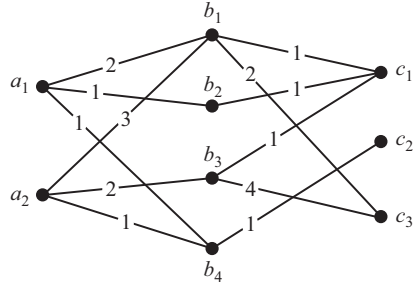


入学年度	学部	学科	組	番号	検	フリガナ
2	3	B	1			氏名

1 The diagram below indicates the number of daily international flights between major airports in three different countries A, B, and C. The number attached to each connecting line shows how many flights there are between the two airports. For instance, from airport  $b_3$  in country B there are 4 flights to airport  $c_3$  in country C each day, but none to airport  $c_2$  in country C.



The relevant data can also be represented by the two matrices

$$P : \begin{matrix} & b_1 & b_2 & b_3 & b_4 \\ a_1 & 2 & 1 & 0 & 1 \\ a_2 & 3 & 0 & 2 & 1 \end{matrix} \quad Q : \begin{matrix} & c_1 & c_2 & c_3 \\ b_1 & 1 & 0 & 2 \\ b_2 & 1 & 0 & 0 \\ b_3 & 1 & 0 & 4 \\ b_4 & 0 & 1 & 0 \end{matrix}$$

Each component of the matrix  $P$  represents the number of choices of flight between  $a_i$  and  $b_j$ , while each component of  $Q$  represents the number of choices of flight between  $b_j$  and  $c_k$ .

a) How many ways are there of getting from  $a_i$  to  $c_k$  using two flights, with one connection in country B? Draw a similar diagram as above without the cities  $b_i$ .

b) Write down the matrix  $R$  each of whose component represents the number of choices of flight between  $a_i$  and  $c_k$ .

c) Calculate the product  $PQ$ , and verify that it coincides with  $R$ .

2 行列  $P, Q, R, S$  を次のようにおく. これらの組み合わせのうち, 積が定義できる場合すべてについて, その積を計算せよ.

$$P = \begin{pmatrix} -2 & 1 & -1 \end{pmatrix}, \quad Q = \begin{pmatrix} 1 & 1 \\ 2 & -1 \\ -1 & 2 \end{pmatrix}, \quad R = \begin{pmatrix} -1 \\ 1 \\ 2 \end{pmatrix}, \quad S = \begin{pmatrix} 3 & -2 & 1 \\ -2 & 1 & -1 \end{pmatrix}$$

3 a)  $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ ,  $B = \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$  とする.  $AB$  および  $BA$  を求めよ.

c)  $A = \begin{pmatrix} 2 & -5 \\ 3 & 4 \end{pmatrix}$  とする.  $PA = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$  となる行列  $P = \begin{pmatrix} p & q \\ r & s \end{pmatrix}$  を求めよ.

b)  $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$  とする. a) を利用して  $ad - bc \neq 0$  のとき  $PA = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$  となる行列  $P = \begin{pmatrix} p & q \\ r & s \end{pmatrix}$  を求めよ. また, このとき  $AP = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$  となることを確かめよ.