WORKOUT MATRIX MULTIPLICATION

Problem 1.
For each of the following pairs of matrices A and B, write down their dimensions, check whether the product AB is defined, and if yes, then compute that product.

(1)
$$A = \begin{pmatrix} 3 & 2 \\ 1 & -1 \end{pmatrix}, \quad B = \begin{pmatrix} 5 & 1 \\ -1 & 2 \end{pmatrix}$$

(2)
$$A = \begin{pmatrix} -4 & 5 \\ -3 & 3 \end{pmatrix}, \quad B = \begin{pmatrix} -5 & -2 \\ -6 & 3 \end{pmatrix}$$

(3)
$$A = \begin{pmatrix} 0 & 1 \\ 22 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} -4 & 1 \\ -4 & 0 \end{pmatrix}$$

(4)
$$A = \begin{pmatrix} 1 & 5 \\ 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & -3 \\ 0 & 1 \end{pmatrix}$$

(5)
$$A = \begin{pmatrix} 1 & -5 \\ 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 8 \\ 0 & 1 \end{pmatrix}$$

(6)
$$A = \begin{pmatrix} 1 & 11 \\ 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 7 \\ 0 & 1 \end{pmatrix}$$

(7)
$$A = \begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 9 \\ 0 & 1 \end{pmatrix}$$

(8)
$$A = \begin{pmatrix} 1 & 5 \\ 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & -3 \\ 0 & 1 \end{pmatrix}$$

(9)
$$A = \begin{pmatrix} 1 & -5 \\ 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 8 \\ 0 & 1 \end{pmatrix}$$

(10)
$$A = \begin{pmatrix} 1 & 11 \\ 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 7 \\ 0 & 1 \end{pmatrix}$$

(11)
$$A = \begin{pmatrix} 1 & -1 \\ 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 9 \\ 0 & 1 \end{pmatrix}$$

(12)
$$A = \begin{pmatrix} 1 & 0 \\ -3 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$$

(13)

$$A = \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 0 \\ -1 & 1 \end{pmatrix}$$

(14)

$$A = \begin{pmatrix} 1 & 0 \\ 5 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 0 \\ -5 & 1 \end{pmatrix}$$

(15)

$$A = \begin{pmatrix} 1 & 0 \\ -8 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 0 \\ 8 & 1 \end{pmatrix}$$

(16)

$$A = \begin{pmatrix} 1 & 0 \\ -7 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 0 \\ -7 & 1 \end{pmatrix}$$

(17)

$$A = \begin{pmatrix} 1 & 4 \\ 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & -4 \\ 0 & 1 \end{pmatrix}$$

(18)

$$A = \begin{pmatrix} 1 & 25 \\ 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & -25 \\ 0 & 1 \end{pmatrix}$$

(19)

$$A = \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 5 & -1 \\ -1 & 0 \end{pmatrix}$$

(20)

$$A = \begin{pmatrix} 4 & 0 \\ 0 & -1 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & 9 \\ 2 & 0 \end{pmatrix}$$

(21)

$$A = \begin{pmatrix} -4 & 0 \\ 0 & -1 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & -9 \\ 2 & 0 \end{pmatrix}$$

(22)

$$A = \begin{pmatrix} -3 & -1 \\ 2 & 5 \end{pmatrix}, \quad B = \begin{pmatrix} 3 & 0 \\ 0 & 11 \end{pmatrix}$$

(23)

$$A = \begin{pmatrix} -1 & 7 \\ 11 & -1 \end{pmatrix}, \quad B = \begin{pmatrix} 3 & 0 \\ 0 & 7 \end{pmatrix}$$

(24)

$$A = \begin{pmatrix} 3 & 0 \\ 0 & 7 \end{pmatrix}, \quad B = \begin{pmatrix} -1 & 7 \\ 11 & -1 \end{pmatrix}$$

(25)

$$A = \begin{pmatrix} 6 & -2 \\ 4 & 2 \\ -1 & 3 \end{pmatrix}, \quad B = \begin{pmatrix} 4 & -1 \\ -2 & -5 \end{pmatrix}$$

(26)

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

(27)

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & 11 \\ -7 & 0 \end{pmatrix}$$

(28)

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{pmatrix}, \quad B = \begin{pmatrix} 10 & 0 \\ 0 & -10 \end{pmatrix}$$

(29)

$$A = \begin{pmatrix} 2 & 1 \\ 1 & -5 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & -1 & -3 \\ 1 & -1 & -2 \end{pmatrix}$$

(30)

$$A = \begin{pmatrix} -1 & 2 \\ -1 & -3 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & 1 & 1 \\ -1 & 1 & -3 \end{pmatrix}$$

(31)

$$A = \begin{pmatrix} 1 & -1 \\ -1 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & -1 & -1 \\ 1 & 1 & -1 \end{pmatrix}$$

(32)

$$A = \begin{pmatrix} -1 & 1 \\ -1 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} -1 & 0 & -1 \\ -1 & -1 & 1 \end{pmatrix}$$

(33)

$$A = \begin{pmatrix} -1 & -1 \\ 0 & -1 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & -1 & -1 \\ -1 & 0 & 1 \end{pmatrix}$$

(34)

$$A = \begin{pmatrix} -1 & 1 \\ -1 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} -1 & 0 & -1 \\ -1 & -1 & 1 \end{pmatrix}$$

(35)

$$A = \begin{pmatrix} 1 & 7 \\ 2 & 3 \\ 0 & 9 \end{pmatrix}, \quad B = \begin{pmatrix} -3 & 11 & 10 \\ -11 & 5 & 9 \end{pmatrix}$$

(36)

$$A = \begin{pmatrix} -5 & 2 \\ 0 & 0 \\ 3 & 4 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & -1 & 2 \\ -3 & 1 & 1 \end{pmatrix}$$

(37)

$$A = \begin{pmatrix} -5 & 0 \\ 0 & 5 \\ 3 & 4 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & -1 & 2 \\ -3 & 1 & 1 \end{pmatrix}$$

(38)

$$A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \\ 2 & 5 \end{pmatrix}, \quad B = \begin{pmatrix} 3 & -4 & 5 \\ -1 & -1 & 2 \end{pmatrix}$$

(39)

$$A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} 2 & -1 & -5 \\ 1 & -2 & -4 \end{pmatrix}$$

(40)

$$A = \begin{pmatrix} 1 & -2 \\ 2 & 1 \\ 1 & -3 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

(41)

$$A = \begin{pmatrix} 1 & -2 \\ 2 & 1 \\ 1 & -3 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

(42)

$$A = \begin{pmatrix} 1 & -2 \\ 2 & 1 \\ 1 & -3 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & 11 & 0 \\ 0 & 0 & -7 \end{pmatrix}$$

(43)

$$A = \begin{pmatrix} 5 & 0 \\ 0 & 0 \\ 0 & -2 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & 9 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$

(44)

$$A = \begin{pmatrix} 0 & 0 \\ 5 & 0 \\ 0 & -2 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & 9 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$

(45)

$$A = \begin{pmatrix} 5 & 0 \\ 0 & -2 \\ 0 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} 9 & 0 & 0 \\ 0 & 3 & 0 \end{pmatrix}$$

(46)

$$A = \begin{pmatrix} 3 & 4 \\ 1 & 4 \\ 0 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} 2 & 9 & 0 \\ 2 & 5 & 0 \end{pmatrix}$$

(47)

$$A = \begin{pmatrix} 1 & -4 \\ 5 & 6 \\ 0 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & -9 & 0 \\ 12 & 4 & 0 \end{pmatrix}$$

(48)

$$A = \begin{pmatrix} 1 & -4 \\ 0 & 0 \\ 3 & 2 \end{pmatrix}, \quad B = \begin{pmatrix} 9 & 0 & -4 \\ 5 & 0 & 2 \end{pmatrix}$$

(49)

$$A = \begin{pmatrix} 2 & 4 & -2 \\ 3 & 1 & 2 \\ -1 & 5 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 5 & 1 & -1 \\ 3 & -1 & -1 \\ 4 & 1 & 2 \end{pmatrix}$$

(50)

$$A = \begin{pmatrix} 1 & 3 & -1 \\ -1 & 0 & -2 \\ 5 & -5 & -5 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & -3 & 3 \\ -1 & 0 & 2 \\ 2 & 4 & -2 \end{pmatrix}$$

(51)

$$A = \begin{pmatrix} 2 & 1 & -5 \\ -2 & -1 & 2 \\ -5 & -3 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} -1 & 2 & -3 \\ 1 & -1 & 10 \\ 3 & -4 & 5 \end{pmatrix}$$

(52)

$$A = \begin{pmatrix} -2 & 4 & 7 \\ 2 & 3 & -3 \\ -3 & -2 & -2 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & -3 & 4 \\ -1 & -4 & -1 \\ -5 & -2 & -5 \end{pmatrix}$$

(53)

$$A = \begin{pmatrix} -1 & 4 & -1 \\ 5 & 7 & -1 \\ -3 & 2 & 2 \end{pmatrix}, \quad B = \begin{pmatrix} -2 & 3 & -7 \\ 7 & 3 & -4 \\ 3 & -2 & -2 \end{pmatrix}$$

(54)

$$A = \begin{pmatrix} -2 & -4 & 2 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} -1 & 1 & -1 \\ 0 & 2 & 2 \\ 0 & 0 & 2 \end{pmatrix}$$

(55)

$$A = \begin{pmatrix} 2 & -3 & 1 \\ 0 & 2 & 1 \\ 0 & 0 & 4 \end{pmatrix}, \quad B = \begin{pmatrix} 2 & 2 & -5 \\ 0 & 1 & 4 \\ 0 & 0 & 3 \end{pmatrix}$$

(56)

$$A = \begin{pmatrix} 2 & 2 & -5 \\ 0 & 1 & 4 \\ 0 & 0 & 3 \end{pmatrix}, \quad B = \begin{pmatrix} 2 & -3 & 1 \\ 0 & 2 & 1 \\ 0 & 0 & 4 \end{pmatrix}$$

(57)

$$A = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix}$$

(58)

$$A = \begin{pmatrix} 1 & 2 & 2 & -5 \\ 3 & 0 & 1 & 4 \\ 3 & 0 & 0 & 3 \\ 1 & -2 & 2 & 3 \end{pmatrix}, \quad B = \begin{pmatrix} -1 & 2 & -3 & 1 \\ 5 & 4 & 2 & -1 \\ 0 & 1 & -1 & 0 \\ 0 & -3 & 2 & 4 \end{pmatrix}$$

(59)

$$A = \begin{pmatrix} 3 & -1 & 1 & -1 \\ 2 & 1 & 0 & 3 \\ 1 & 3 & 3 & 2 \\ -1 & 0 & 1 & 4 \end{pmatrix}, \quad B = \begin{pmatrix} 5 & -1 & 2 & -2 \\ 2 & 3 & 1 & -3 \\ 1 & -1 & -2 & -4 \\ 1 & 0 & -5 & 2 \end{pmatrix}$$

(60)

$$A = \begin{pmatrix} 0 & 7 & 8 & 1 \\ -3 & 0 & -1 & -3 \\ -2 & 1 & 1 & -1 \\ 2 & -1 & -5 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} -1 & 2 & -3 & 1 \\ -5 & 1 & -1 & 2 \\ 1 & 5 & 0 & 1 \\ 1 & -1 & 3 & -2 \end{pmatrix}$$

(61)

$$A = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 5 \end{pmatrix}, \quad B = \begin{pmatrix} -1 & 2 & -3 & 1 \\ -5 & 1 & -1 & 2 \\ 1 & 5 & 0 & 1 \\ 1 & -1 & 3 & -2 \end{pmatrix}$$

(62)

$$A = \begin{pmatrix} -1 & 2 & -3 & 1 \\ -5 & 1 & -1 & 2 \\ 1 & 5 & 0 & 1 \\ 1 & -1 & 3 & -2 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 5 \end{pmatrix}$$

(63)

$$A = \begin{pmatrix} -1 & 2 & -3 & 1 \\ -5 & 1 & -1 & 2 \\ 1 & 5 & 0 & 1 \\ 1 & -1 & 3 & -2 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 2 \end{pmatrix}$$

(64)

$$A = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 2 \end{pmatrix}, \quad B = \begin{pmatrix} -1 & 2 & -3 & 1 \\ -5 & 1 & -1 & 2 \\ 1 & 5 & 0 & 1 \\ 1 & -1 & 3 & -2 \end{pmatrix}$$

(65)

$$A = \begin{pmatrix} 3 & 7 & 0 & 0 \\ 1 & 2 & 0 & 0 \\ 0 & 0 & 2 & 5 \\ 0 & 0 & 4 & 2 \end{pmatrix}, \quad B = \begin{pmatrix} 2 & -3 & 0 & 0 \\ -1 & 3 & 0 & 0 \\ 0 & 0 & -1 & -4 \\ 0 & 0 & 3 & 7 \end{pmatrix}$$

(66)

$$A = \begin{pmatrix} 3 & 7 & 0 & 0 \\ 1 & 2 & 0 & 0 \\ 0 & 0 & 2 & 5 \\ 0 & 0 & 4 & 2 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & 0 & 2 & -3 \\ 0 & 0 & -1 & 3 \\ -1 & -4 & 0 & 0 \\ 3 & 7 & 0 & 0 \end{pmatrix}$$

(67)

$$A = \begin{pmatrix} 0 & 0 & 2 & -3 \\ 0 & 0 & -1 & 3 \\ -1 & -4 & 0 & 0 \\ 3 & 7 & 0 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} 3 & 7 & 0 & 0 \\ 1 & 2 & 0 & 0 \\ 0 & 0 & 2 & 5 \\ 0 & 0 & 4 & 2 \end{pmatrix}$$

(68)
$$A = \begin{pmatrix} 0 & 3 & 0 & -1 \\ 3 & 0 & 4 & 0 \\ 0 & -1 & 0 & 3 \\ -2 & 0 & 7 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & 4 & 0 & 5 \\ -2 & 0 & 7 & 0 \\ 0 & 11 & 0 & 11 \\ 3 & 0 & -5 & 0 \end{pmatrix}$$

(69)
$$A = \begin{pmatrix} 0 & 1 & 0 & -2 \\ 2 & 0 & 5 & 0 \\ 0 & 1 & 0 & -3 \\ -1 & 0 & -4 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} 0 & 5 & 0 & 1 \\ 3 & 0 & -1 & 0 \\ 0 & 2 & 0 & 4 \\ -5 & 0 & 2 & 0 \end{pmatrix}$$

Problem 2.
You have been employed by a developer for mathematical software. Your job is to test a part of their linear algebra engine: the software accepts two matrices A and B as input and either produces the matrix–matrix product AB whenever defined, or an error message when A does not have as many columns as B has rows. To test the software, you prepare several test cases.

For each of the following pairs of matrices A and B, determine their dimension and whether the product AB is defined. If AB is defined, determine the dimension and write down the product.

(70)
$$A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}, \quad B = \begin{pmatrix} e & f \\ g & h \end{pmatrix}$$

(71)
$$A = \begin{pmatrix} a & b \end{pmatrix}, \quad B = \begin{pmatrix} w & x \\ y & z \end{pmatrix}$$

(72)
$$A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}, \quad B = \begin{pmatrix} x & y \end{pmatrix}$$

(73)
$$A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}, \quad B = \begin{pmatrix} x \\ y \end{pmatrix}$$

(74)
$$A = \begin{pmatrix} a \\ b \end{pmatrix}, \quad B = \begin{pmatrix} w & x \\ y & z \end{pmatrix}$$

(75)
$$A = \begin{pmatrix} a \\ b \end{pmatrix}, \quad B = \begin{pmatrix} x \\ y \end{pmatrix}$$

(76)
$$A = \begin{pmatrix} a & b \end{pmatrix}, \quad B = \begin{pmatrix} x & y \end{pmatrix}$$

(77)
$$A = \begin{pmatrix} a \\ b \end{pmatrix}, \quad B = \begin{pmatrix} x & y \end{pmatrix}$$

(78)
$$A = \begin{pmatrix} a & b \end{pmatrix}, \quad B = \begin{pmatrix} x \\ y \end{pmatrix}$$

(79)

$$A = \begin{pmatrix} u \end{pmatrix}, \quad B = \begin{pmatrix} x \\ y \end{pmatrix}$$

(80)

$$A = \begin{pmatrix} a \\ b \end{pmatrix}, \quad B = \begin{pmatrix} w \end{pmatrix}$$

(81)

$$A = \begin{pmatrix} a & b \end{pmatrix}, \quad B = \begin{pmatrix} v \end{pmatrix}$$

(82)

$$A = \begin{pmatrix} c \end{pmatrix}, \quad B = \begin{pmatrix} x & y \end{pmatrix}$$

(83)

$$A = \begin{pmatrix} x \end{pmatrix}, \quad B = \begin{pmatrix} y \end{pmatrix}$$

(84)

$$A = \begin{pmatrix} u \end{pmatrix}, \quad B = \begin{pmatrix} x \\ y \\ z \end{pmatrix}$$

(85)

$$A = \begin{pmatrix} a \\ b \\ c \end{pmatrix}, \quad B = \begin{pmatrix} w \end{pmatrix}$$

(86)

$$A = \begin{pmatrix} a & b & c \end{pmatrix}, \quad B = \begin{pmatrix} v \end{pmatrix}$$

(87)

$$A = \begin{pmatrix} c \end{pmatrix}, \quad B = \begin{pmatrix} x & y & z \end{pmatrix}$$

(88)

$$A = \begin{pmatrix} x \end{pmatrix}, \quad B = \begin{pmatrix} y \end{pmatrix}$$

(89)

$$A = \begin{pmatrix} u & v \\ w & x \\ y & z \end{pmatrix}, \quad B = \begin{pmatrix} e & f \\ g & h \end{pmatrix}$$

(90)

$$A = \begin{pmatrix} e & f \\ g & h \end{pmatrix}, \quad B = \begin{pmatrix} u & v \\ w & x \\ y & z \end{pmatrix}$$

(91)

$$A = \begin{pmatrix} a & b & c \\ d & e & f \end{pmatrix}, \quad B = \begin{pmatrix} u & v \\ w & x \\ y & z \end{pmatrix}$$

(92)

$$A = \begin{pmatrix} a & b & c \\ d & e & f \end{pmatrix}, \quad B = \begin{pmatrix} x \\ y \\ z \end{pmatrix}$$

(93)

$$A = \begin{pmatrix} x \\ y \\ z \end{pmatrix}, \quad B = \begin{pmatrix} a & b & c \\ d & e & f \end{pmatrix}$$

(94)

$$A = \begin{pmatrix} x & y & z \end{pmatrix}, \quad B = \begin{pmatrix} a & b & c \\ d & e & f \end{pmatrix}$$

(95)

$$A = \begin{pmatrix} x & y & z \end{pmatrix}, \quad B = \begin{pmatrix} a & b \\ c & d \\ e & f \end{pmatrix}$$

(96)

$$A = \begin{pmatrix} u & v \\ w & x \\ y & z \end{pmatrix}, \quad B = \begin{pmatrix} a & b & c \\ d & e & f \end{pmatrix}$$

(97)

$$A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}, \quad B = \begin{pmatrix} u & v & w \\ x & y & z \end{pmatrix}$$

(98)

$$A = \begin{pmatrix} a & b \end{pmatrix}, \quad B = \begin{pmatrix} u & v & w \\ x & y & z \end{pmatrix}$$

(99)

$$A = \begin{pmatrix} u & v & w \\ x & y & z \end{pmatrix}, \quad B = \begin{pmatrix} a & b \end{pmatrix}$$

(100)

$$A = \begin{pmatrix} a & b \end{pmatrix}, \quad B = \begin{pmatrix} k & u & v & w \\ l & x & y & z \end{pmatrix}$$

(101)

$$A = \begin{pmatrix} k & u & v & w \\ l & x & y & z \end{pmatrix}, \quad B = \begin{pmatrix} a & b \end{pmatrix}$$

(102)

$$A = \begin{pmatrix} x \end{pmatrix}, \quad B = \begin{pmatrix} a & b & c \\ d & e & f \end{pmatrix}$$

(103)

$$A = \begin{pmatrix} a & b & c \\ d & e & f \end{pmatrix}, \quad B = \begin{pmatrix} x \end{pmatrix}$$

(104)

$$A = \begin{pmatrix} x \end{pmatrix}, \quad B = \begin{pmatrix} a & b & c \end{pmatrix}$$

(105)

$$A = \begin{pmatrix} a & b & c \end{pmatrix}, \quad B = \begin{pmatrix} x \end{pmatrix}$$

(106)

$$A = \begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix}, \quad B = \begin{pmatrix} r & s & t \\ u & v & w \\ x & y & z \end{pmatrix}$$

Problem 3.
Write down a matrix A that maps a vector to the indicated vector. Test your solution with a few vectors.

(108)

$$A \begin{pmatrix} v_1 \\ v_2 \end{pmatrix} = \begin{pmatrix} -v_2 \\ v_2 \end{pmatrix}$$

(109)

$$A \begin{pmatrix} v_1 \\ v_2 \end{pmatrix} = \begin{pmatrix} v_1 - v_2 \\ v_1 + v_2 \end{pmatrix}$$

(110)

$$A \begin{pmatrix} v_1 \\ v_2 \end{pmatrix} = \begin{pmatrix} 3v_1 - 3v_2 \\ 2v_1 + 5v_2 \end{pmatrix}$$

(111)

$$A \begin{pmatrix} v_1 \\ v_2 \end{pmatrix} = \begin{pmatrix} 10v_2 \\ 0.1v_1 \end{pmatrix}$$

(112)

$$A \begin{pmatrix} v_1 \\ v_2 \end{pmatrix} = \begin{pmatrix} v_1 - \frac{1}{2}v_2 \\ v_2 + \frac{1}{3}v_1 \end{pmatrix}$$

(113)

$$A \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} = \begin{pmatrix} v_2 - v_3 \\ v_1 + v_3 \\ -v_1 - v_2 \end{pmatrix}$$

(114)

$$A \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} = \begin{pmatrix} v_2 \\ v_3 \\ v_1 \end{pmatrix}$$

(115)

$$A \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} = \begin{pmatrix} v_3 \\ v_1 \\ v_2 \end{pmatrix}$$

(116)

$$A \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} = \begin{pmatrix} v_1 + 3v_2 - v_3 \\ v_1 - v_2 + v_3 \\ 3v_1 + 2v_3 \end{pmatrix}$$

(117)

$$A \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} = \begin{pmatrix} 4v_2 + 5v_3 \\ -2v_1 - 4v_2 - 5v_3 \\ v_2 \end{pmatrix}$$