Questions: Introduction to matrices

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Summary

A selection of questions on matrices.

Before attempting these questions, it is highly recommended that you read [Guide: Introduction to matrices].

Q1

You are given the following matrices:

$$A = \begin{bmatrix} 2 & -1 & \sqrt{3} \\ 0 & 4 & -\pi \end{bmatrix}, \quad B = \begin{bmatrix} 2 & -2 \\ 3 & -4 \end{bmatrix}, \quad C = \begin{bmatrix} 0 & -1 & 2 & 3 \\ 4 & -\sqrt{2} & 1 & -5 \\ 6 & \pi & -7 & 0 \end{bmatrix}, \quad D = \begin{bmatrix} 3 & -1 \\ \sqrt{5} & x \\ y & 1/2 \end{bmatrix},$$

$$E = \begin{bmatrix} 1 & -2 & \sqrt{7} \\ 1 & 3 & -4 \\ 5 & -6 & 7 \end{bmatrix}, \quad F = \begin{bmatrix} -2 & 3/4 & -1 \\ \pi & -\sqrt{3} & x^2 \\ 7 & 0 & -5 \end{bmatrix}, \quad G = \begin{bmatrix} -1 \\ 5 \\ 1 \\ 8 \\ 3 \end{bmatrix}, \quad H = \begin{bmatrix} \sqrt{2} & -3 & 4 \\ 5 & -1 & 2/3 \\ x & \pi & -7 \\ 8 & 9 & -10 \end{bmatrix}.$$

Q1.1

Give the dimensions of all matrices A-H.

Q1.2

Give the values of the following entries:

a. a_{11}

b. g_{41}

c. d_{12}

d. f_{32}

e. b_{21}

f. a_{12}

g. c_{23}

h. e_{23}

i. h_{31}

j. h_{13}

k. e_{32}

l. g_{11}

Q1.3

Give the main diagonals of the matrices A, C, E, and G.

Q2

You are given the following matrices:

$$I = \begin{bmatrix} 3 \\ -\sqrt{5} \\ 2 \\ \pi \end{bmatrix}, \quad J = \begin{bmatrix} -1 \\ 5 \\ 2/3 \\ -\sqrt{7} \end{bmatrix}, \quad K = \begin{bmatrix} 1 & -2 & 3 \\ 4 & 1 & -5 \\ 6 & -7 & \pi \end{bmatrix}, \quad L = \begin{bmatrix} \sqrt{3} & -4 & 5/2 \\ -6 & 7 & -8 \\ 9 & -1 & 10 \end{bmatrix},$$

$$M = \begin{bmatrix} 1 & -2 & 3 & 4 \\ 5 & -1 & \sqrt{2} & -6 \end{bmatrix}, \quad N = \begin{bmatrix} -\pi & 3/4 & -1 & 2 \\ 0 & -\sqrt{5} & x & 7 \end{bmatrix}, \quad O = \begin{bmatrix} 1 & -2 \\ 3 & 4 \\ -5 & 1 \end{bmatrix}, \quad P = \begin{bmatrix} \sqrt{3} & -4 \\ \pi & 5 \\ -6 & 7 \end{bmatrix}.$$

Calculate the following questions using matrix addition, subtraction, and scalar multiplication:

a. $I + J$

b. $L - K$

c. $N + M$

d. $O - P$

e. $3I$

f. $-2J$

g. xK

h. $-4L$

i. yM

j. $7N$

k. $(1/2)O$

l. $-4P$

m. $3I + J$

n. $-2(K + L)$

o. $N - 4M$

Q3

You are given the following matrices:

$$Q = \begin{bmatrix} 2 & 3 & 1 & 4 \end{bmatrix}, \quad R = \begin{bmatrix} -1 \\ 3 \\ \pi \\ 5 \end{bmatrix}, \quad S = \begin{bmatrix} 1 & -2 & 5 \\ -3 & 4 & -1 \end{bmatrix}, \quad T = \begin{bmatrix} 5 & -6 \\ 7 & 2 \\ 0 & 8 \end{bmatrix},$$

$$U = \begin{bmatrix} -1 & 2 \\ 3 & -4 \end{bmatrix}, \quad V = \begin{bmatrix} \sqrt{2} & -1/2 \\ 3 & 7 \end{bmatrix}, \quad W = \begin{bmatrix} 0 & -1 & 2 & \pi \\ 3 & -4 & 5 & -6 \\ 1 & \sqrt{7} & -8 & 9 \end{bmatrix}, \quad X = \begin{bmatrix} 4 \\ 1/2 \end{bmatrix}.$$

Finally calculate the following using matrix multiplication:

a. QR

b. RQ

c. ST

d. TS

e. UV

f. VU

g. WR

h. SW

i. TU

j. TV

k. TX

l. UX

m. VX

n. XQ

o. VV

p. UU

q. UXQ

r. U^3

s. STV

t. $TXQR$

u. $3UX$

v. $(ST) - 2U$

w. $WR + TX$

x. $-RQR$

y. $(V + U)X$

z. $4U^2 + V^2$

After attempting the questions above, please click this link to find the answers.

Version history

v1.0: initial version created 04/25 by Jessica Taberner as part of a University of St Andrews VIP project.