Questions: Introduction to Matrices

Jessica Taberner

Summary

A selection of questions on matrices.

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

Q1

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

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

Q1.1

Give the dimensions of the following matrices:

1.1.1. A

1.1.2. B

1.1.3. C

1.1.4. D

1.1.5. E

1.1.6. F

1.1.7. G

1.1.8. H

Q1.2

Give the values of the following entries:

1.2.1. $a_{1,1}$

1.2.2. $g_{4,1}$

1.2.3. $d_{1,2}$

1.2.4. $f_{3,2}$

1.2.5. $b_{2,1}$

1.2.6. $a_{1,2}$

1.2.7. $c_{2,3}$

1.2.8. $e_{2,3}$

1.2.9. $h_{3,1}$

1.2.10. $h_{1,3}$

1.2.11. $e_{3,2}$

1.2.12. $g_{1,1}$

Q1.3

Give the main diagonals of the following matrices:

1.3.1. A

1.3.2. C

1.3.3. E

1.3.4. G

Q2

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

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

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

Q2.1

2.1.1. $I + J$

2.1.2. $L - K$

2.1.3. $N + M$

2.1.4. $O - P$

2.1.5. $3I$

2.1.6. $-2J$

2.1.7. xK

2.1.8. $-4L$

2.1.9. yM

2.1.10. $7N$

2.1.11. $(1/2)O$

2.1.12. $-4P$

2.1.13. $3I + J$

2.1.14. $-2(K + L)$

2.1.15. $N - 4M$

2.1.16. $5O - iP$

Q3

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

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

Calculate the following using matrix multiplication:

Q3.1

3.1.1. QR

3.1.2. RQ

3.1.3. ST

3.1.4. TS

3.1.5. UV

3.1.6. VU

3.1.7. WR

3.1.8. SW

3.1.9. TU

3.1.10. TV

3.1.11. TX

3.1.12. UX

3.1.13. VX

3.1.14. XQ

3.1.15. VV

3.1.16. UU

Q3.2

3.2.1. UXQ

3.2.2. U^3

3.2.3. STV

3.2.4. $TXQR$

Q3.3

3.3.1. $3UX$

3.3.2. $(ST) - 2U$

3.3.3. $WR + TX$

3.3.4. $-RQR$

3.3.5. $(V + U)X$

3.3.6. $4U^2 + V^2$

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

Version history

v1.0: initial version created 04/25 by ect6 (as part of a University of St Andrews VIP project)