Answers: Introduction to matrices

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Summary

Answers to a selection of questions on matrices.

These are the answers to [Questions: Introduction to matrices].

Please attempt the questions before reading these answers!

Q1

Q1.1

The matrix A has dimension 2×3

The matrix B has dimension 2×2

The matrix C has dimension 3×4

The matrix D has dimension 3×2

The matrix E has dimension 3×3

The matrix F has dimension 3×3

The matrix G has dimension 5×1

The matrix H has dimension 4×3

Q1.2

a. $a_{11} = 2$

b. $g_{41} = 8$

c. $d_{12} = -1$

d. $f_{32} = 0$

e. $b_{21} = 3$

f. $a_{12} = -1$

g. $c_{23} = 1$

h. $e_{23} = -4$

i. $h_{31} = x$

j. $h_{13} = 4$

k. $e_{32} = -6$

l. $g_{11} = -1$

Q1.3

$diagA = (2, 4)$

$diagC = (0, -\sqrt{2}, -7)$

$diagE = (1, 3, 7)$

$diagG = (-1)$

Q2

a. $I + J = \begin{bmatrix} 2 \\ 5 - \sqrt{5} \\ 8/3 \\ \pi - \sqrt{7} \end{bmatrix}$

b. $L - K = \begin{bmatrix} -1 + \sqrt{3} & -2 & -1/2 \\ -10 & 6 & -3 \\ 3 & 6 & 10 - \pi \end{bmatrix}$

c. $N + M = \begin{bmatrix} -\pi + 1 & -5/4 & 2 & 6 \\ 5 & 1 - \sqrt{5} & x + \sqrt{2} & 1 \end{bmatrix}$

d. $O - P = \begin{bmatrix} 1 - \sqrt{3} & 2 \\ 3 - \pi & -1 \\ 1 & -6 \end{bmatrix}$

e. $3I = \begin{bmatrix} 9 \\ -3\sqrt{5} \\ 6 \\ 3\pi \end{bmatrix}$

f. $-2J = \begin{bmatrix} 2 \\ -10 \\ -4/3 \\ 2\sqrt{7} \end{bmatrix}$

g. $xK = \begin{bmatrix} x & -2x & 3x \\ 4x & x & -5x \\ 6x & -7x & \pi x \end{bmatrix}$

h. $-4L = \begin{bmatrix} \sqrt{3} & -4 & 5/2 \\ 24 & -28 & 32 \\ -36 & 4 & -40 \end{bmatrix}$

i. $yM = \begin{bmatrix} y & -2y & 3y & 4y \\ 5y & -y & \sqrt{2}y & -6y \end{bmatrix}$

j. $7N = \begin{bmatrix} -7\pi & 21/4 & -7 & 14 \\ 0 & -7\sqrt{5} & 7x & 49 \end{bmatrix}$

k. $(1/2)O = \begin{bmatrix} 1/2 & -1 \\ 3/2 & 2 \\ -5/2 & 1/2 \end{bmatrix}$

l. $-4P = \begin{bmatrix} -4\sqrt{3} & 16 \\ -4\pi & -20 \\ 24 & 28 \end{bmatrix}$

m. $3I + J = \begin{bmatrix} 8 \\ 5 - 3\sqrt{5} \\ 20/3 \\ 3\pi - \sqrt{7} \end{bmatrix}$

n. $-2(K + L) = \begin{bmatrix} -2 - 2\sqrt{3} & 12 & -11 \\ 4 & -16 & 26 \\ -30 & 14 = 2 & -20 - 2\pi \end{bmatrix}$

o. $N - 4M = \begin{bmatrix} -4 - \pi & 35/4 & -13 & -14 \\ -20 & 4 - \sqrt{5} & x - 4\sqrt{2} & 31 \end{bmatrix}$

Q3

a. $QR = \begin{bmatrix} 27 + \pi \end{bmatrix}$

b. $RQ = \begin{bmatrix} -2 & -3 & -1 & -4 \\ 6 & 9 & 3 & 12 \\ 2\pi & 3\pi & \pi & 4\pi \\ 10 & 15 & 5 & 20 \end{bmatrix}$

c. $ST = \begin{bmatrix} -9 & 30 \\ 13 & 18 \end{bmatrix}$

d. $TS = \begin{bmatrix} 23 & -34 & 31 \\ 1 & -6 & 33 \\ -24 & 32 & -8 \end{bmatrix}$

e. $UV = \begin{bmatrix} 6-\sqrt{2} & 29/2 \\ -12+3\sqrt{2} & -59/2 \end{bmatrix}$

f. $VU = \begin{bmatrix} -3/2-\sqrt{2} & 2+2\sqrt{2} \\ 18 & -22 \end{bmatrix}$

g. $WR = \begin{bmatrix} -3+7\pi \\ -45+5\pi \\ 44+3\sqrt{7}-8\pi \end{bmatrix}$

h. $SW = \begin{bmatrix} -1 & 7+5\sqrt{7} & -48 & 57+\pi \\ 11 & -13-\sqrt{7} & 22 & -33-3\pi \end{bmatrix}$

i. $TU = \begin{bmatrix} -23 & 34 \\ -1 & 6 \\ 24 & -32 \end{bmatrix}$

j. $TV = \begin{bmatrix} 18-5\sqrt{2} & -89/2 \\ 6+7\sqrt{2} & 21/2 \\ 24 & 56 \end{bmatrix}$

k. $TX = \begin{bmatrix} 17 \\ 29 \\ 4 \end{bmatrix}$

l. $UX = \begin{bmatrix} -3 \\ 10 \end{bmatrix}$

m. $VX = \begin{bmatrix} -1/4+4\sqrt{2} \\ 31/2 \end{bmatrix}$

n. $XQ = \begin{bmatrix} -8 & 12 & 4 & 16 \\ 1 & 3/2 & 1/2 & 2 \end{bmatrix}$

o. $VV = \begin{bmatrix} 1/2 & -7/2 - \sqrt{2}/2 \\ 21 + 3\sqrt{2} & 95/2 \end{bmatrix}$

p. $UU = \begin{bmatrix} 7 & -10 \\ -15 & 22 \end{bmatrix}$

q. $UXQ = \begin{bmatrix} -6 & -9 & -3 & -12 \\ 20 & 30 & 10 & 40 \end{bmatrix}$

r. $U^3 = \begin{bmatrix} -37 & 54 \\ 81 & -118 \end{bmatrix}$

s. $STU = \begin{bmatrix} 99 & -138 \\ 41 & -46 \end{bmatrix}$

t. $TXQR = \begin{bmatrix} 459 + 17\pi \\ 783 + 29\pi \\ 108 + 4\pi \end{bmatrix}$

u. $3UX = \begin{bmatrix} -18 \\ 60 \end{bmatrix}$

v. $(ST) - 2U = \begin{bmatrix} -11 & 26 \\ 7 & 10 \end{bmatrix}$

w. $WR + TX = \begin{bmatrix} 14 + 7\pi \\ -16 + 5\pi \\ 18 + 3\sqrt{7} - 8\pi \end{bmatrix}$

x. $-RQR = \begin{bmatrix} 27 + \pi \\ -81 - 3\pi \\ -27\pi + \pi^2 \\ 135 + 5\pi \end{bmatrix}$

y. $(V + U)X = \begin{bmatrix} -5 - 3\sqrt{2} \\ 61 \end{bmatrix}$

z. $4U^2 + V^2 = \begin{bmatrix} 57/2 & -87/2 - \sqrt{2}/2 \\ -39 + 3\sqrt{2} & 271/2 \end{bmatrix}$

Version history

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