How do you add two matrices together? What are the conditions for matrix addition?

1

How can a matrix be scaled?

2

How is matrix subtraction performed? What are the conditions?

3

What is the condition for matrix multiplication?

4

How do we determine the value of the cell i, j when multiplying a matrix A by another matrix B?

5

What is the identity matrix?

6

How do you work out the transpose of a matrix? What is the notation?

7

What is a symmetric matrix?

8

Just multiply each cell in the matrix by the scaling factor.

2

In order for you to be able to add two matrices together, they must both have the same dimensions. Then, just add value of each position in one matrix to the corresponding position in the other matrix.

$$(A+B)_{ij} = A_{ij} + B_{ij}$$

1

The number of columns in the first matrix must equal the number of rows in the second.

4

In order to subtract one matrix from another, just scale the first one by a factor of -1 and add them together. As with addition, the matrices must have the same dimensions.

$$(A-B)_{ij} = (A+(-1)B)_{ij}$$

3

A square matrix where every cell is set to zero, except from those on the diagonal from the top left to the bottom right, where they are set to one. For example:

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

6

It depends on the values in the i'th row of A and the j'th column of B.

$$C_{ij} = \sum_{k=1}^{n} A_{ik} B_{kj}$$

5

A matrix M is symmetric when $M = M^T$. This means it is symmetric along the main diagonal.

Alternately, you could say that $M_{ij} = M_{ji}$.

8

To work out the transpose of a matrix, you simply rotate everything clockwise by 90°. E.g.:

$$A = \begin{pmatrix} 1 & 3 \\ 0 & 5 \\ 8 & 7 \end{pmatrix}$$

$$A^T = \begin{pmatrix} 1 & 0 & 8 \\ 3 & 5 & 7 \end{pmatrix}$$

7

Define the zero matrix.

9

Define the term **commuting matrices**.

10

Is matrix multiplication associative?

11

Is matrix multiplication a distributive operation?

12

Does the following hold between the two matrices A and B:

$$(AB^T) = A^T B^T$$

13

Does the following matrix represent a point or a vector?

$$\begin{bmatrix} 4 \\ 2 \\ 3 \\ 1 \end{bmatrix}$$

14

Does the following matrix represent a point or a vector?

$$\begin{bmatrix} 4 \\ 2 \\ 3 \\ 0 \end{bmatrix}$$

15

What cells are the same for all affine transformation matrices?

16

A pair of matrices A, B where $AB = BA$

10

A matrix where all of the cells have a value of zero.

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

9

Yes.

$$A(B+C) = AB + AC$$
$$(B+C)A = BA + CA$$

12

Yes.

$$A(BC) = (AB)C$$

11

The point $(4, 2, 3)$.

14

Yes.

13

The bottom three/four.

$$\begin{pmatrix} a_{11} & a_{12} & a_{13} & b1 \\ a_{21} & a_{22} & a_{23} & b2 \\ a_{31} & a_{32} & a_{33} & b3 \\ 0 & 0 & 0 & 1 \end{pmatrix} \textit{ and } \begin{pmatrix} a_{11} & a_{12} & b1 \\ a_{21} & a_{22} & b2 \\ 0 & 0 & 1 \end{pmatrix}$$

16

The vector $4i + 2j + 3k$.

15

What is the matrix that will perform an affine translation?

17

What is the matrix that will perform an affine scaling?

18

How is it possible to combine two or more affine transformation matrices?

19

How do you do transformation matrix powers?

20

What is the identity transformation?

21

$$\begin{pmatrix} x & 0 & 0 & 0 \\ 0 & y & 0 & 0 \\ 0 & 0 & z & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

18

$$\begin{pmatrix} 1 & 0 & 0 & x \\ 0 & 1 & 0 & y \\ 0 & 0 & 1 & z \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

17

You apply the matrix n times, where n is the power.

20

Multiply them together in the reverse order for which they are to be applied.

19

A transformation that does nothing.

21