Matrix Definitions

Practice Quiz • 10 min • 3 total points

Congratulations! You passed!

Grade received 100% **To pass** 100% or higher

Go to next item

1. Identify the two-by-two matrix with matrix elements $a_{ij} = i - j$. 1 / 1 point

- ○ $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$
- ○ $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$
- ◉ $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$

Correct

2. The matrix product $\begin{pmatrix} 1 & -1 \\ -1 & 1 \end{pmatrix} \begin{pmatrix} -1 & 1 \\ 1 & -1 \end{pmatrix}$ is equal to 1 / 1 point

- ◉ $\begin{pmatrix} -2 & 2 \\ 2 & -2 \end{pmatrix}$
- ○ $\begin{pmatrix} 2 & -2 \\ -2 & 2 \end{pmatrix}$
- ○ $\begin{pmatrix} -2 & 2 \\ -2 & 2 \end{pmatrix}$
- ○ $\begin{pmatrix} -2 & -2 \\ 2 & 2 \end{pmatrix}$

Correct

3. Let A and B be n-by-n matrices with $(\mathrm{AB})_{ij} = \sum_{k=1}^{n} a_{ik} b_{kj}$. If A and B are upper triangular matrices, then $a_{ik} = 0$ or $b_{kj} = 0$ when 1 / 1 point

A. $k < i$ B. $k > i$ C. $k < j$ D. $k > j$

- ○ A or C only
- ◉ A or D only
- ○ B or C only
- ○ B or D only

Correct

Transposes and Inverses

Practice Quiz • 10 min • 3 total points

Congratulations! You passed!

Grade received 100% To pass 100% or higher

Go to next item

1. $(ABC)^T$ is equal to 1 / 1 point

- $A^TB^TC^T$
- $A^TC^TB^T$
- $C^TA^TB^T$
- $C^TB^TA^T$ (selected)

Correct

2. Suppose A is a square matrix. Which matrix is not symmetric? 1 / 1 point

- $A + A^T$
- AA^T
- $A - A^T$ (selected)
- A^TA

Correct

3. Which matrix is the inverse of $\begin{pmatrix} 2 & 2 \\ 1 & 2 \end{pmatrix}$? 1 / 1 point

- $\frac{1}{2}\begin{pmatrix} 2 & -2 \\ -1 & 2 \end{pmatrix}$ (selected)
- $\frac{1}{2}\begin{pmatrix} -2 & 2 \\ 1 & -2 \end{pmatrix}$
- $\frac{1}{2}\begin{pmatrix} 2 & 2 \\ -1 & -2 \end{pmatrix}$
- $\frac{1}{2}\begin{pmatrix} -2 & -2 \\ 1 & 2 \end{pmatrix}$

Correct

Orthogonal Matrices

Practice Quiz • 10 min • 3 total points

Congratulations! You passed!

Grade received 100% **To pass** 100% or higher

Go to next item

1. Which matrix is not orthogonal? 1 / 1 point

- ○ $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$
- ○ $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$
- ◉ $\begin{pmatrix} 1 & -1 \\ 0 & 0 \end{pmatrix}$

Correct

2. Which matrix rotates a three-by-one column vector an angle θ counterclockwise around the x-axis? 1 / 1 point

- ◉ $\begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta \\ 0 & \sin\theta & \cos\theta \end{pmatrix}$
- ○ $\begin{pmatrix} \sin\theta & 0 & \cos\theta \\ 0 & 1 & 0 \\ \cos\theta & 0 & -\sin\theta \end{pmatrix}$
- ○ $\begin{pmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$

Correct

3. Which matrix, when left multiplying another matrix, moves row one to row two, row two to row three, and row three to row one? 1 / 1 point

- ○ $\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$
- ◉ $\begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$
- ○ $\begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$

Correct

Week One Assessment

Graded Quiz • 30 min

Congratulations! You passed!

Grade received 90% | Latest Submission Grade 90% | To pass 60% or higher

Go to next item

1. Identify the two-by-two matrix with matrix elements $a_{ij} = ij$. 1 / 1 point

- ○ $\begin{pmatrix} 1 & 4 \\ 4 & 2 \end{pmatrix}$
- ○ $\begin{pmatrix} 2 & 1 \\ 1 & 4 \end{pmatrix}$
- ◉ $\begin{pmatrix} 1 & 2 \\ 2 & 4 \end{pmatrix}$
- ○ $\begin{pmatrix} 4 & 2 \\ 2 & 1 \end{pmatrix}$

Correct

2. The matrix product $\begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 5 & 3 \\ 3 & 2 \end{pmatrix}$ is equal to 1 / 1 point

- ○ $\begin{pmatrix} 5 & 3 \\ 8 & 5 \end{pmatrix}$
- ○ $\begin{pmatrix} 5 & 8 \\ 3 & 5 \end{pmatrix}$
- ○ $\begin{pmatrix} 8 & 3 \\ 3 & 5 \end{pmatrix}$
- ◉ $\begin{pmatrix} 8 & 5 \\ 5 & 3 \end{pmatrix}$

Correct

3. Let A be a lower triangular matrix with elements a_{ij}. Then $a_{ij} = 0$ when 1 / 1 point

- ○ $i \geq j$
- ○ $i \leq j$
- ○ $i > j$
- ◉ $i < j$

Correct

4. Let A, B, and C be n-by-n invertible matrices. Then $(\mathrm{ABC})^{-1}$ is equal to

1 / 1 point

- $\mathrm{A}^{-1}\mathrm{B}^{-1}\mathrm{C}^{-1}$
- $\mathrm{A}^{-1}\mathrm{C}^{-1}\mathrm{B}^{-1}$
- $\mathrm{C}^{-1}\mathrm{B}^{-1}\mathrm{A}^{-1}$
- $\mathrm{C}^{-1}\mathrm{A}^{-1}\mathrm{B}^{-1}$

Correct

5. Which matrix is skew symmetric?

1 / 1 point

- $\mathrm{A} - \mathrm{A}^{\mathrm{T}}$
- $\mathrm{A} + \mathrm{A}^{\mathrm{T}}$
- $\mathrm{A}\mathrm{A}^{\mathrm{T}}$
- $\mathrm{A}^{\mathrm{T}}\mathrm{A}$

Correct

6. Which matrix is the inverse of $\begin{pmatrix} 1 & 2 \\ 2 & 2 \end{pmatrix}$?

1 / 1 point

- $\frac{1}{2}\begin{pmatrix} -2 & 2 \\ 2 & -1 \end{pmatrix}$
- $\frac{1}{2}\begin{pmatrix} 2 & -2 \\ -2 & 1 \end{pmatrix}$
- $\frac{1}{2}\begin{pmatrix} 2 & -2 \\ 2 & 1 \end{pmatrix}$
- $\frac{1}{2}\begin{pmatrix} -2 & 2 \\ -1 & 2 \end{pmatrix}$

Correct

7. Which matrix is not orthogonal?

1 / 1 point

- $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$
- $\begin{pmatrix} 1 & 0 & 0 \\ 0 & \sqrt{2}/2 & -\sqrt{2}/2 \\ 0 & -\sqrt{2}/2 & \sqrt{2}/2 \end{pmatrix}$
- $\begin{pmatrix} 1 & 0 & 0 \\ 0 & \sqrt{2}/2 & -\sqrt{2}/2 \\ 0 & \sqrt{2}/2 & \sqrt{2}/2 \end{pmatrix}$
- $\begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$

Correct

8. Which matrix, when placed to the left of another matrix to multiply, permutes rows two and three of the other matrix? **0 / 1 point**

- ○ $\begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$
- ◉ $\begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$
- ○ $\begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$
- ○ $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$

✗ **Incorrect**
Review Permutation Matrices and associated practice problems.

9. A matrix raised to the 5th power is the matrix multiplied by itself five times, and the trace of a matrix is the sum of its diagonal elements. What is the trace of **1 / 1 point**

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 0 & 1 & 2 & 3 & 4 & 5 \\ 0 & 0 & 1 & 2 & 3 & 4 \\ 0 & 0 & 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix}^5 ?$$

- ◉ 6
- ○ 12
- ○ 18
- ○ 24

✓ **Correct**

10. Let $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and write A as the sum of a symmetric and skew-symmetric matrix. The skew-symmetric matrix is equal to **1 / 1 point**

- ○ $\frac{1}{2}\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$
- ○ $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$
- ◉ $\frac{1}{2}\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$
- ○ $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$

✓ **Correct**