

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

1 punto

- ☐  $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$
- ☐  $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$
- ☐  $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$
- ☒  $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$

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

1 punto

- ☒  $\begin{pmatrix} -2 & 2 \\ 2 & -2 \end{pmatrix}$
- ☐  $\begin{pmatrix} 2 & -2 \\ -2 & 2 \end{pmatrix}$
- ☐  $\begin{pmatrix} -2 & 2 \\ 2 & 2 \end{pmatrix}$
- ☒  $\begin{pmatrix} -2 & 2 \\ 2 & -2 \end{pmatrix}$
- ☐  $\begin{pmatrix} 2 & -2 \\ -2 & 2 \end{pmatrix}$
- ☐  $\begin{pmatrix} -2 & 2 \\ -2 & 2 \end{pmatrix}$
- ☐  $\begin{pmatrix} -2 & -2 \\ 2 & 2 \end{pmatrix}$

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

1 punto

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

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

1 / 1 punto

- ☐  $A^T B^T C^T$
- ☐  $A^T C^T B^T$
- ☐  $C^T A^T B^T$
- ☒  $C^T B^T A^T$

✓ Correcto

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

1 / 1 punto

- ☐  $A + A^T$
- ☐  $AA^T$
- ☒  $A - A^T$
- ☐  $A^T A$

✓ Correcto

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

1 / 1 punto

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

✓ Correcto

2. Which matrix rotates a three-by-one column vector an angle  $\theta$  counterclockwise around the  $x$ -axis?

1 / 1 punto

- ☒  $\begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos \theta & -\sin \theta \\ 0 & \sin \theta & \cos \theta \end{pmatrix}$
- ☐  $\begin{pmatrix} \sin \theta & 0 & \cos \theta \\ 0 & 1 & 0 \\ \cos \theta & 0 & -\sin \theta \end{pmatrix}$
- ☐  $\begin{pmatrix} \cos \theta & -\sin \theta & 0 \\ \sin \theta & \cos \theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$
- ☐  $\begin{pmatrix} \cos \theta & \sin \theta & 0 \\ -\sin \theta & \cos \theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$

✓ Correcto

1. Which matrix is not orthogonal?

1 / 1 punto

- ☐  $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$
- ☐  $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$
- ☐  $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$
- ☒  $\begin{pmatrix} 1 & -1 \\ 0 & 0 \end{pmatrix}$

✓ Correcto

2. Which matrix rotates a three-by-one column vector an angle  $\theta$  counterclockwise around the  $x$ -axis?

1 / 1 punto

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

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 punto

- ☐  $\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$
- ☒  $\begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$
- ☐  $\begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$
- ☐  $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$

✓ Correcto

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

1 / 1 punto

☐  $\begin{pmatrix} 1 & 4 \\ 4 & 2 \end{pmatrix}$

☐  $\begin{pmatrix} 2 & 1 \\ 1 & 4 \end{pmatrix}$

☒  $\begin{pmatrix} 1 & 2 \\ 2 & 4 \end{pmatrix}$

☐  $\begin{pmatrix} 4 & 2 \\ 2 & 1 \end{pmatrix}$

✓ Correcto

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 punto

☐  $\begin{pmatrix} 5 & 3 \\ 8 & 5 \end{pmatrix}$

☐  $\begin{pmatrix} 5 & 8 \\ 3 & 5 \end{pmatrix}$

☐  $\begin{pmatrix} 8 & 3 \\ 3 & 5 \end{pmatrix}$

☒  $\begin{pmatrix} 8 & 5 \\ 5 & 3 \end{pmatrix}$

✓ Correcto

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

1 / 1 punto

☐  $i \geq j$

☐  $i \leq j$

☐  $i > j$

☒  $i < j$

✓ Correcto

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

1 / 1 punto

☐  $A^{-1}B^{-1}C^{-1}$

☐  $A^{-1}C^{-1}B^{-1}$

☒  $C^{-1}B^{-1}A^{-1}$

☐  $C^{-1}A^{-1}B^{-1}$

✓ Correcto

5. Which matrix is skewsymmetric?

1/1 punto

- ☒  $A - A^T$
- ☐  $A + A^T$
- ☐  $AA^T$
- ☐  $A^T A$

✓ Correcto

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

1/1 punto

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

7. Which matrix is not orthogonal?

1/1 punto

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

✓ Correcto

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

0/1 punto

- ☐  $\begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$
- ☐  $\begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$
- ☒  $\begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$
- ☐  $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$

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 punto

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

- ☒ 6  
☐ 12  
☐ 18  
☐ 24

✓ Correcto

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 punto

- ☐  $\frac{1}{2} \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$   
☐  $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$   
☒  $\frac{1}{2} \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$   
☐  $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$

✓ Correcto