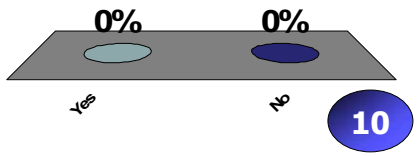
Linear Algebra

Clicker questions

Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 2 & 3 & 10 \\ 1 & 6 & -8 & 0 \end{bmatrix}$. Is the product CA defined?

1. Yes
2. ✓ No



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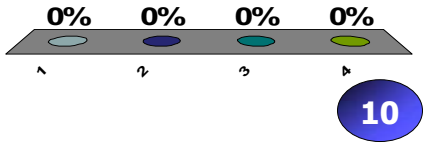
Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 2 & 3 & 10 \\ 1 & 6 & -8 & 0 \end{bmatrix}$. What is the product of A with the third column of C?

1. $\begin{bmatrix} -13 & -23 \end{bmatrix}$
2. $\begin{bmatrix} 10 \\ 30 \end{bmatrix}$
3. $\begin{bmatrix} 10 & 30 \end{bmatrix}$
4. ✓ $\begin{bmatrix} -13 \\ -23 \end{bmatrix}$



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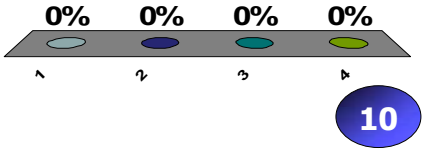
Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$. What is AB equal to?

1. $\begin{bmatrix} 19 & 43 \\ 22 & 50 \end{bmatrix}$
2. ✓ $\begin{bmatrix} 19 & 22 \\ 43 & 50 \end{bmatrix}$
3. $\begin{bmatrix} 23 & 34 \\ 31 & 46 \end{bmatrix}$
4. $\begin{bmatrix} 9 & 43 \\ 22 & -10 \end{bmatrix}$



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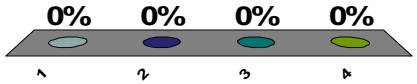
Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$. What is BA equal to?

1. $\begin{bmatrix} 19 & 43 \\ 22 & 50 \end{bmatrix}$
2. $\begin{bmatrix} 19 & 22 \\ 43 & 50 \end{bmatrix}$
3. ✔ $\begin{bmatrix} 23 & 34 \\ 31 & 46 \end{bmatrix}$
4. $\begin{bmatrix} 9 & 43 \\ 22 & -10 \end{bmatrix}$



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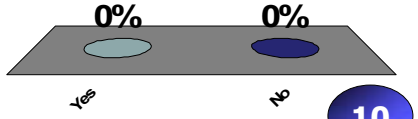
Are the rows of the following matrix linearly independent?

$$C = \begin{bmatrix} 1 & 2 & 3 & 10 \\ 1 & 6 & -8 & 0 \end{bmatrix}$$

1. ✔ Yes
2. No



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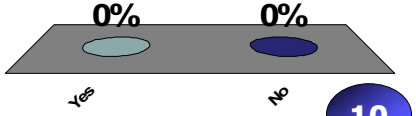
Do the following vectors make a basis for $\mathbb{R}^2$?

$$\begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ 3 \end{bmatrix}, \begin{bmatrix} 3 \\ 5 \end{bmatrix}$$

1. Yes
2. ✔ No



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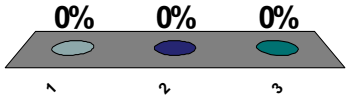
Which of the following sets of vectors is a basis of $\mathbb{R}^3$?

1. $\left\{ \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix}, \begin{bmatrix} 3 \\ 3 \\ 3 \end{bmatrix} \right\}$
2. $\left\{ \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix} \right\}$
3. ✔ $\left\{ \begin{bmatrix} 0 \\ -3 \\ 3 \end{bmatrix}, \begin{bmatrix} -3 \\ 0 \\ 3 \end{bmatrix}, \begin{bmatrix} 3 \\ 3 \\ 3 \end{bmatrix} \right\}$



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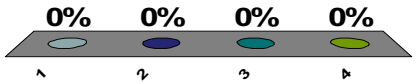
What is the rank of the following matrix?

$$C = \begin{bmatrix} 1 & 2 & 3 & 10 \\ 1 & 6 & -8 & 0 \end{bmatrix}$$

1. 1
2. ✓ 2
3. 3
4. 4



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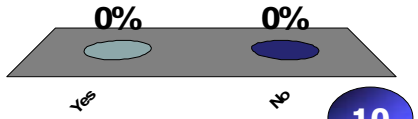
Does the transpose of a matrix A have the same rank as A?

1. ✓ Yes
2. No



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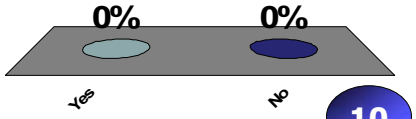
Is the determinant of the following matrix equal to 0?

$$\begin{bmatrix} 1 & 4 & 3 \\ 2 & 5 & 3 \\ 3 & 6 & 3 \end{bmatrix}$$

1. ✓ Yes
2. No



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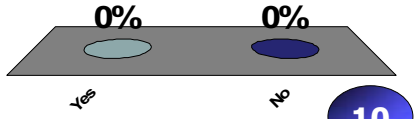
Is the determinant of the following matrix equal to 0?

$$\begin{bmatrix} 0 & -3 & 3 \\ -3 & 0 & 3 \\ 3 & 3 & 3 \end{bmatrix}$$

1. Yes
2. ✓ No



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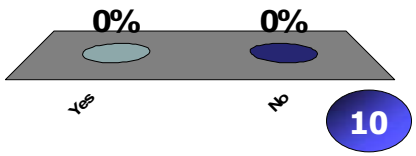
Is the determinant of the following matrix equal to 0?

$$\begin{bmatrix} 1 & 5 & 9 & 1 \\ 2 & 6 & 10 & 1 \\ 3 & 7 & 11 & 1 \\ 4 & 8 & 12 & 1 \end{bmatrix}$$

✓1. Yes
2. No



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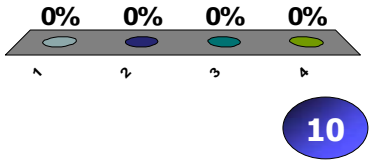
What is the inverse of the following matrix? $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

1. $\frac{1}{2}\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

2. $\frac{-1}{2}\begin{bmatrix} 4 & 2 \\ 3 & 1 \end{bmatrix}$

3. $\frac{-1}{2}\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

✓4. $\frac{-1}{2}\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$



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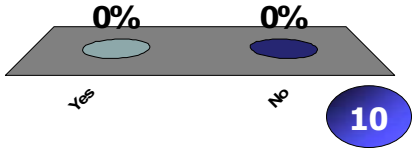
Does the following system of equations have a unique solution?

$$\begin{cases} -3x_2 + 3x_3 = 4 \\ -3x_1 + 3x_3 = -6 \\ 3x_1 + 3x_2 + 3x_3 = 8 \end{cases}$$

✓1. Yes
2. No



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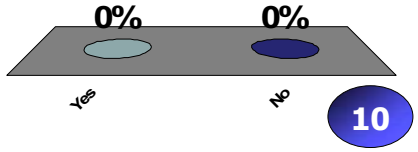
Is the following system consistent?

$$\begin{bmatrix} 1 & 1 \\ 1 & 2 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

1. Yes
✓2. No



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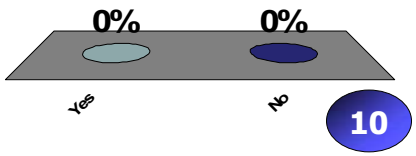
Does the following system of equations have a unique solution?

$$\begin{cases} x_1 + 5x_2 + 9x_3 + x_4 = 0 \\ 2x_1 + 6x_2 + 10x_3 + x_4 = 0 \\ 3x_1 + 7x_2 + 11x_3 + x_4 = 0 \\ 4x_1 + 8x_2 + 12x_3 + x_4 = 0 \end{cases}$$

1. Yes
2. ✔ No



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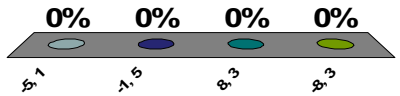
10

What are the eigenvalues of the following matrix?

$$\begin{bmatrix} -1 & 9 \\ 0 & 5 \end{bmatrix}$$

1. -5, 1
2. ✔ -1, 5
3. 8, 3
4. -8, 3



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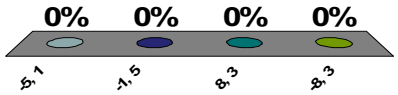
10

What are the eigenvalues of the following matrix?

$$\begin{bmatrix} -13 & -36 \\ 6 & 17 \end{bmatrix}$$

1. -5, 1
2. ✔ -1, 5
3. 8, 3
4. -8, 3



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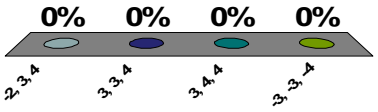
10

What are the eigenvalues of the following matrix?

$$\begin{bmatrix} 4 & -1 & 1 \\ -1 & 4 & -1 \\ -1 & 1 & 2 \end{bmatrix}$$

1. -2, 3, 4
2. ✔ 3, 3, 4
3. 3, 4, 4
4. -3, -3, -4



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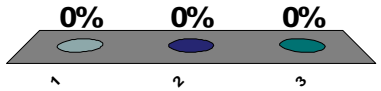
What is the algebraic multiplicity of the eigenvalue $\lambda = 3$ of the following matrix?

$$\begin{bmatrix} 4 & -1 & 1 \\ -1 & 4 & -1 \\ -1 & 1 & 2 \end{bmatrix}$$

1. 1
2. 2 ✓
3. 3



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10

Which set of vectors consists of eigenvectors of the following matrix?

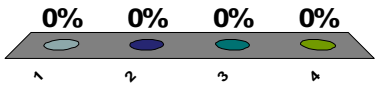
$$\begin{bmatrix} -1 & 9 \\ 0 & 5 \end{bmatrix}$$

1. $\begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

2. $\begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 2 \\ 3 \end{bmatrix}$

3. $\begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ 2 \end{bmatrix}$ ✓

4. $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$



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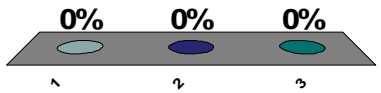
10

What is the geometric multiplicity of the eigenvalue $\lambda = 3$ of the following matrix?

$$\begin{bmatrix} 4 & -1 & 1 \\ -1 & 4 & -1 \\ -1 & 1 & 2 \end{bmatrix}$$

1. 1
2. 2 ✓
3. 3



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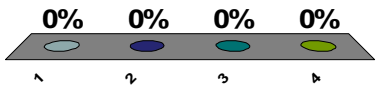
What is the algebraic multiplicity of the eigenvalue $\lambda = 4$ of the following matrix?

$$\begin{bmatrix} 4 & 1 & 0 & 0 \\ 0 & 4 & 0 & 0 \\ 0 & 0 & 4 & 1 \\ 0 & 0 & 0 & 4 \end{bmatrix}$$

1. 1
2. 2
3. 3
4. 4 ✓



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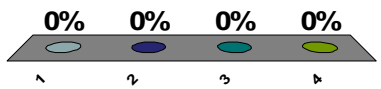
10

What is the geometric multiplicity of the eigenvalue $\lambda = 4$ of the following matrix?

$$\begin{bmatrix} 4 & 1 & 0 & 0 \\ 0 & 4 & 0 & 0 \\ 0 & 0 & 4 & 1 \\ 0 & 0 & 0 & 4 \end{bmatrix}$$

1. 1
2. ✓ 2
3. 3
4. 4



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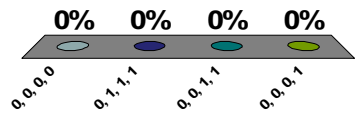
10

What are the eigenvalues of the following matrix?

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

1. ✓ 0, 0, 0, 0
2. 0, 1, 1, 1
3. 0, 0, 1, 1
4. 0, 0, 0, 1



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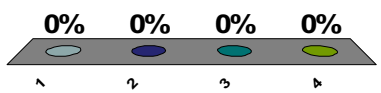
What is the algebraic multiplicity of the eigenvalue $\lambda = 0$ of the following matrix?

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

1. 1
2. 2
3. 3
4. ✓ 4



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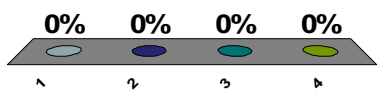
What is the geometric multiplicity of the eigenvalue $\lambda = 0$ of the following matrix?

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

1. ✓ 1
2. 2
3. 3
4. 4



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