The function $f(x, y) = 2xy + y^2$

- has no stationary point
- has a stationary point at (0, 0)
- has a stationary point at (1, 1)
- has a stationary point at (-1, -1)

The matrix $A = \begin{bmatrix} 4 & 1 & -1 \\ 1 & 2 & 1 \\ -1 & 1 & 2 \end{bmatrix}$ is

1 point

- positive definite
- positive semi-definite
- negative definite
- negative semi-definite

The matrix $A = \begin{bmatrix} 6 & 2 \\ 2 & 1 \end{bmatrix}$ is positive definite.

1 point

- True
- False

The function $f(x, y) = 4 + x^3 + y^3 - 3xy$ has a stationary point at

1 point

- (1, 1)
- (1, 2)
- (-1, 2)
- (2, -1)

The correct representation of $x^2 - z^2 + 2yz + 2xz$ in the matrix form is

1 point

- ○ $[x \quad y \quad z]\begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}$
- ○ $[x \quad y \quad z]\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}$
- ○ $[x \quad y \quad z]\begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 0 \\ 1 & -1 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}$
- ○ $[x \quad y \quad z]\begin{bmatrix} 1 & 1 & 1 \\ -1 & 0 & 1 \\ 1 & 1 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}$

Given a function $f(x, y) = -3x^2 - 6xy - 6y^2$, the point $(0, 0)$ is a _______

1 point

- ○ maxima.
- ○ minima.
- ○ saddle point.
- ○ none of these

The matrix $\begin{bmatrix} 6 & 5 \\ 5 & 4 \end{bmatrix}$ is

1 point

- ○ positive definite.
- ○ positive semi-definite.
- ○ neither positive definite nor positive semi-definite.
- ○ can not be determined

Select all the statements that are true about the $A = \begin{bmatrix} -6 & 0 & 0 \\ 0 & -5 & 0 \\ 0 & 0 & -7 \end{bmatrix}$

1 point

- ○ A is positive definite.
- ○ A is positive semi-definite.
- ○ A is negative definite.
- ○ can not be determined

A matrix 2x2 A has determinant 8 and trace 6. Which of the following are true about the matrix?

1 point

- ○ A is positive definite.
- ○ A is positive semi-definite.
- ○ A is neither positive definite nor positive semi-definite.
- ○ Can not be determined

The singular values of a matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ are

1 point

- ○ 1, 5
- ○ 3, 4
- ○ 2, 5
- ○ 1, 3

The SVD of the matrix $A = \begin{bmatrix} 0 & 1 & 1 \\ \sqrt{2} & 2 & 0 \\ 0 & 1 & 1 \end{bmatrix}$ is

1 point

- [ ] $A = \begin{bmatrix} \frac{2}{\sqrt{6}} & -\frac{1}{\sqrt{3}} & \frac{2}{\sqrt{2}} \\ \frac{2}{\sqrt{6}} & \frac{2}{\sqrt{3}} & 0 \\ \frac{1}{\sqrt{6}} & -\frac{2}{\sqrt{3}} & -\frac{1}{\sqrt{2}} \end{bmatrix} \begin{bmatrix} 2\sqrt{2} & 0 & 0 \\ 0 & \sqrt{2} & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} \frac{1}{\sqrt{6}} & \frac{3}{\sqrt{12}} & \frac{1}{\sqrt{12}} \\ \frac{1}{\sqrt{3}} & 0 & -\frac{2}{\sqrt{6}} \\ \frac{1}{\sqrt{2}} & -\frac{1}{2} & \frac{1}{2} \end{bmatrix}$
- [ ] $A = \begin{bmatrix} \frac{1}{\sqrt{6}} & -\frac{1}{\sqrt{3}} & \frac{1}{\sqrt{2}} \\ \frac{2}{\sqrt{6}} & \frac{1}{\sqrt{3}} & 0 \\ \frac{1}{\sqrt{6}} & -\frac{1}{\sqrt{3}} & -\frac{1}{\sqrt{2}} \end{bmatrix} \begin{bmatrix} 2\sqrt{3} & 0 & 0 \\ 0 & \sqrt{3} & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} \frac{1}{\sqrt{6}} & \frac{3}{\sqrt{12}} & \frac{1}{\sqrt{12}} \\ \frac{1}{\sqrt{3}} & 0 & -\frac{2}{\sqrt{6}} \\ \frac{1}{\sqrt{12}} & -\frac{3}{\sqrt{6}} & \frac{1}{24} \end{bmatrix}$
- [ ] $A = \begin{bmatrix} \frac{1}{\sqrt{6}} & -\frac{1}{\sqrt{3}} & \frac{1}{\sqrt{2}} \\ \frac{2}{\sqrt{6}} & \frac{1}{\sqrt{3}} & 0 \\ \frac{1}{\sqrt{6}} & -\frac{1}{\sqrt{3}} & -\frac{1}{\sqrt{2}} \end{bmatrix} \begin{bmatrix} 2\sqrt{3} & 0 & 0 \\ 0 & \sqrt{3} & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} \frac{1}{\sqrt{6}} & \frac{3}{\sqrt{12}} & \frac{1}{\sqrt{12}} \\ \frac{1}{\sqrt{3}} & 0 & -\frac{2}{\sqrt{6}} \\ \frac{1}{\sqrt{2}} & -\frac{1}{2} & \frac{1}{2} \end{bmatrix}$
- [ ] $A = \begin{bmatrix} \frac{1}{\sqrt{6}} & -\frac{1}{\sqrt{3}} & \frac{1}{\sqrt{2}} \\ \frac{2}{\sqrt{6}} & \frac{1}{\sqrt{3}} & 0 \\ \frac{1}{\sqrt{6}} & -\frac{1}{\sqrt{3}} & -\frac{1}{\sqrt{2}} \end{bmatrix} \begin{bmatrix} 2\sqrt{2} & 0 & 0 \\ 0 & \sqrt{2} & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} \frac{1}{\sqrt{6}} & \frac{3}{\sqrt{12}} & \frac{1}{\sqrt{12}} \\ \frac{1}{\sqrt{3}} & 0 & -\frac{2}{\sqrt{6}} \\ \frac{1}{\sqrt{2}} & -\frac{1}{2} & \frac{1}{2} \end{bmatrix}$

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Find the singular values of $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$

1 point

- [ ] 1.618, -0.618
- [ ] 1.618, 0.618
- [ ] 2.618, 0.382
- [ ] 2.618, -0.382

The SVD of matrix $A = \begin{bmatrix} 2 & 0 \\ 1 & 2 \end{bmatrix}$ is

1 point

- $\begin{bmatrix} 0.645 & -0.53 \\ 0.826 & 0.414 \end{bmatrix} \begin{bmatrix} 2.56 & 0 \\ 0 & 1.56 \end{bmatrix} \begin{bmatrix} 0.826 & -0.644 \\ 0.644 & 0.826 \end{bmatrix}^T$
- $\begin{bmatrix} 0.645 & -0.53 \\ -0.826 & 0.414 \end{bmatrix} \begin{bmatrix} 2.56 & 0 \\ 0 & 1.56 \end{bmatrix} \begin{bmatrix} 0.826 & -0.644 \\ 0.644 & 0.826 \end{bmatrix}^T$
- $\begin{bmatrix} 0.645 & -0.53 \\ 0.826 & 0.414 \end{bmatrix} \begin{bmatrix} -2.56 & 0 \\ 0 & 1.56 \end{bmatrix} \begin{bmatrix} 0.826 & -0.644 \\ 0.644 & 0.826 \end{bmatrix}^T$
- $\begin{bmatrix} -0.645 & -0.53 \\ 0.826 & 0.414 \end{bmatrix} \begin{bmatrix} 2.56 & 0 \\ 0 & 1.56 \end{bmatrix} \begin{bmatrix} 0.826 & -0.644 \\ 0.644 & 0.826 \end{bmatrix}^T$