
1. (1 pt) Library/Rochester/setLinearAlgebra23QuadraticForms-
/ur.la.23.1.pg

Write the matrix of the quadratic form

$$Q(x) = -9x_1^2 + 2x_2^2 - 1x_3^2 - 1x_1x_2 + 3x_1x_3 - 9x_2x_3.$$

$$A = \begin{bmatrix} _ & _ & _ \\ _ & _ & _ \\ _ & _ & _ \end{bmatrix}.$$

Correct Answers:

- -9
- -0.5
- 1.5
- -0.5
- 2
- -4.5
- 1.5
- -4.5
- -1

2. (1 pt) Library/Rochester/setLinearAlgebra23QuadraticForms-
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Find the eigenvalues of the matrix

$$M = \begin{bmatrix} -55 & 5 \\ 5 & -55 \end{bmatrix}.$$

Enter the two eigenvalues, separated by a comma:

Classify the quadratic form $Q(x) = x^T Ax$:

- A. $Q(x)$ is indefinite
- B. $Q(x)$ is negative definite
- C. $Q(x)$ is positive definite
- D. $Q(x)$ is positive semidefinite
- E. $Q(x)$ is negative semidefinite

Correct Answers:

- -50, -60
- B

3. (1 pt) Library/Rochester/setLinearAlgebra23QuadraticForms-
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The matrix

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$$

has three distinct eigenvalues, $\lambda_1 < \lambda_2 < \lambda_3$,

$$\lambda_1 = _,$$

$$\lambda_2 = _,$$

$$\lambda_3 = _.$$

Classify the quadratic form $Q(x) = x^T Ax$:

- A. $Q(x)$ is positive definite
- B. $Q(x)$ is positive semidefinite
- C. $Q(x)$ is indefinite
- D. $Q(x)$ is negative definite
- E. $Q(x)$ is negative semidefinite

Correct Answers:

- 1
- 3
- 4
- A

4. (1 pt) Library/Rochester/setLinearAlgebra23QuadraticForms-
/ur.la.23.4.pg

If $A = \begin{bmatrix} 2 & 8 \\ 8 & 3 \end{bmatrix}$ and $Q(x) = x \cdot Ax$,

Then $Q(e_1) = _$ and $Q(e_2) = _$.

Correct Answers:

- 2
- 3

5. (1 pt) Library/Rochester/setLinearAlgebra23QuadraticForms-
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If $A = \begin{bmatrix} 2 & -6 & 9 \\ -6 & 6 & -5 \\ 9 & -5 & -7 \end{bmatrix}$ and $Q(x) = x \cdot Ax$,

Then $Q(x_1, x_2, x_3) = _ x_1^2 + _ x_2^2 + _ x_3^2 + _ x_1x_2 + _ x_1x_3 + _ x_2x_3$.

Correct Answers:

- 2
- 6
- -7
- -12
- 18
- -10