

# General inner products: lengths and distances

TOTAL POINTS 5

## 1.Question 1

Compute the length of

$$\mathbf{x} = \begin{bmatrix} 1 & -1 & 3 \end{bmatrix}$$

using the inner product defined

$$\langle \mathbf{a}, \mathbf{b} \rangle = \mathbf{a}^T \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix} \mathbf{b}$$

Do the exercise using pen and paper.

1 / 1 point

- ☐  $\sqrt{31}$
- ☐  $\sqrt{11}$
- ☒  $\sqrt{26}$
- ☐  $\sqrt{29}$
- ☐ 26

## 2.Question 2

Compute the squared distance between

$$\mathbf{x} = \begin{bmatrix} 1/2 & -1 & -1/2 \end{bmatrix}$$

and

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

using the inner product defined as

$$\langle \mathbf{a}, \mathbf{b} \rangle = \mathbf{a}^T \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix} \mathbf{b}$$

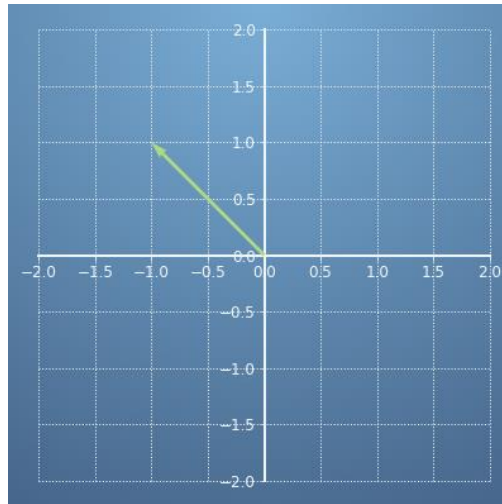
Do the exercise using pen and paper.

1 / 1 point

- ☒ 5

- ☐  $\sqrt{9/2}$
- ☐  $9/2$
- ☐  $\sqrt{5}$

### 3.Question 3



Compute the length of

$\mathbf{x} = [-1 \ 1]$  using the inner product defined by

$$\langle \mathbf{a}, \mathbf{b} \rangle = (\mathbf{a}^T)^{1/2} [5 \ -1], [-1 \ 5] \mathbf{b}$$

Do the exercise using pen and paper.

1 / 1 point

- ☒  $\sqrt{6}$
- ☐  $\sqrt{2}$
- ☐ 6
- ☐  $\sqrt{12}$
- ☐ 12

### 4.Question 4

Compute the distance (not squared) between

$$\mathbf{x} = [4 \ 2 \ 1]$$

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

using the inner product defined as

$$\langle \mathbf{a}, \mathbf{b} \rangle = \mathbf{a}^T \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix} \mathbf{b}$$

Do the exercise using pen and paper (and calculator if necessary). Please enter a decimal number.

1 / 1 point

6.5

### 5.Question 5

Compute the length of

$$\mathbf{x} = \begin{bmatrix} -1 & -1 & -1 \end{bmatrix} \text{ using the inner product defined as}$$

$$\langle \mathbf{a}, \mathbf{b} \rangle = \mathbf{a}^T \mathbf{I} \mathbf{b} \text{ where } \mathbf{I} \text{ is the identity matrix.}$$

Do the exercise using pen and paper.

1 / 1 point

- ☐  $-\sqrt{3}$
- ☐  $-3$
- ☒  $\sqrt{3}$
- ☐  $3$