



✓ Congratulations! You passed!

TO PASS 80% or higher

Keep Learning

100%

1/1 point

Properties of inner products

LATEST SUBMISSION GRADE

100%

1. The function

 $eta(\mathbf{x},\mathbf{y}) = \mathbf{x}^Tegin{bmatrix} 2 & -1 \ -1 & 1 \end{bmatrix}\mathbf{y}$

✓ symmetric

✓ Correct

Yes: $eta(\mathbf{x},\mathbf{y}) = eta(\mathbf{y},\mathbf{x})$

- not an inner product
- positive definite

Yes, the matrix has only positive eigenvalues and $eta(\mathbf{x},\mathbf{x})>0$ for all $\mathbf{x}
eq \mathbf{0}$ and $\beta(\mathbf{x},\mathbf{x})=0\iff \mathbf{x}=\mathbf{0}$

an inner product

It's symmetric, bilinear and positive definite. Therefore, it is a valid inner product.

✓ bilinear

✓ Correct

- β is symmetric. Therefore, we only need to show linearity in one argument.
- For any $\lambda \in \mathbb{R}$ it holds that $\beta(\mathbf{x} + \lambda \mathbf{z}, \mathbf{y}) = \beta(\mathbf{x}, \mathbf{y}) + \lambda \beta(\mathbf{z}, \mathbf{y})$. This holds because of the rules for vector-matrix multiplication and addition.
- not symmetric
- not bilinear
- not positive definite
- 2. The function

$$eta(\mathbf{x},\mathbf{y}) = \mathbf{x}^Tegin{bmatrix} 1 & -1 \ -1 & 1 \end{bmatrix}\mathbf{y}$$

not an inner product

Correct: Since $\boldsymbol{\beta}$ is not positive definite, it cannot be an inner product.

an inner product

1/1 point

✓ symmetric	
\checkmark Correct: $eta(\mathbf{x},\mathbf{y})=eta(\mathbf{y},\mathbf{x})$	
positive definite	
not symmetric	
ont positive definite	
\checkmark Correct With $x=[1,1]^T$ we get $eta(\mathbf{x},\mathbf{x})=0$. Therefore eta is not positive definite.	
▽ bilinear	
✓ Correct Correct:	
- eta is symmetric. Therefore, we only need to show linearity in one argument.	
• $\beta(\mathbf{x} + \lambda \mathbf{z}, \mathbf{y}) = \beta(\mathbf{x}, \mathbf{y}) + \lambda \beta(\mathbf{z}, \mathbf{y})$. This holds because of the rules for vector-matrix multiplication and addition.	
not bilinear	
The function	1 / 1 point
$eta(\mathbf{x},\mathbf{y}) = \mathbf{x}^Tegin{bmatrix} 2 & 1 \ -1 & 1 \end{bmatrix}\!\mathbf{y}$	
is	

3.

- symmetric
- not symmetric

✓ Correct

Correct: If we take $\mathbf{x}={[1,1]}^T$ and $\mathbf{y}={[2,-1]}^T$ then $eta(\mathbf{x},\mathbf{y})=0$ but $eta(\mathbf{y},\mathbf{x})=6$. Therefore, β is not symmetric.

bilinear

✓ Correct

Correct.

- not bilinear
- an inner product
- not an inner product

✓ Correct

Correct: Symmetry is violated.

4. The function

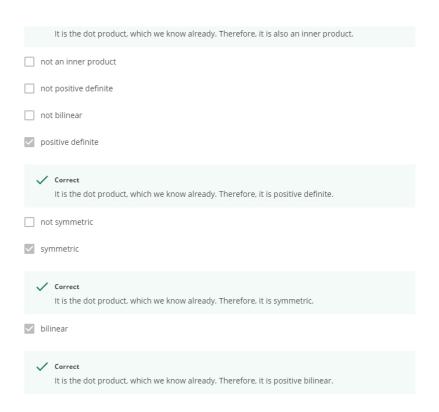
$$\beta(\mathbf{x},\mathbf{y}) = \mathbf{x}^T \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \mathbf{y}$$

İS

an inner product

✓ Correct

1/1 point



5. For any two vectors $\mathbf{x}, \mathbf{y} \in \mathbb{R}^2$ write a short piece of code that defines a valid inner product.

import numpy as np

def dot(a, b):
 """Compute dot product between a and b.
 Args:
 a, b: (2,) ndarray as R^2 vectors

Returns:
 a number which is the dot product between a, b

dot_product = a.T @ b

return dot_product

fast your code before you submit.
 a = np.array([1,0])
 b = np.array([0,1])
 Reset

return dot(a,b))

Run

Run

Run

Reset

✓ Correct

Good job!

1/1 point