## Congratulations! You passed!

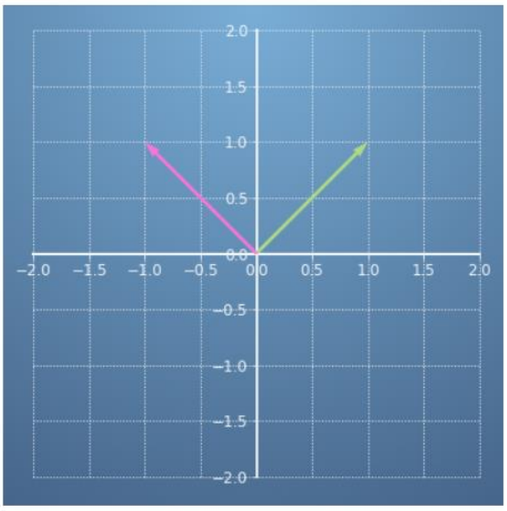
Grade received 100%

Latest Submission Grade 100%

To pass 80% or higher

Go to next item

**1.** 1 / 1 point



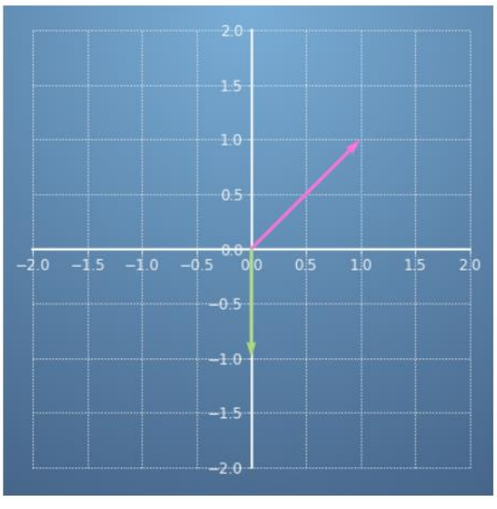

Compute the angle between $\mathbf{x} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ and $\mathbf{y} = \begin{bmatrix} -1 \\ 1 \end{bmatrix}$ using the inner product defined by

$$\langle \mathbf{x}, \mathbf{y} \rangle = \mathbf{x}^T \begin{bmatrix} 2 & -1 \\ -1 & 4 \end{bmatrix} \mathbf{y}$$

- 0.35 rad $(20^\circ)$
- 1.2 rad $(69^\circ)$
- 1.57 rad $(90^\circ)$

**Correct**
Absolutely right!

**2.** 1 / 1 point




Compute the angle between $\mathbf{x} = \begin{bmatrix} 0 \\ -1 \end{bmatrix}$ and $\mathbf{y} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ using the inner product defined by

$$\langle \mathbf{x}, \mathbf{y} \rangle = \mathbf{x}^T \begin{bmatrix} 1 & -\frac{1}{2} \\ -\frac{1}{2} & 5 \end{bmatrix} \mathbf{y}.$$

To aid in computing this angle and the next ones in this quiz, let's write an expression in Python for the angle between two vectors using a non-standard inner product.

Remember $\cos\alpha = \frac{\langle x,y \rangle}{\|x\| \cdot \|y\|} = \frac{\langle x,y \rangle}{\sqrt{\langle x,x \rangle} \cdot \sqrt{\langle y,y \rangle}}$

Complete the expressions for norm_x and norm_y and then run the code. You might find the NumPy function np.sqrt useful.

```
# the matrix A defines the inner product
A = np.array([[1, -1/2],[-1/2,5]])
x = np.array([0,-1])
y = np.array([1,1])

def find_angle(A, x, y):
    """Compute the angle"""
    inner_prod = x.T @ A @ y
    # Fill in the expression for norm_x and norm_y below
    norm_x = 1
    norm_y = 1.41
    alpha = inner_prod/(norm_x*norm_y)
    angle = np.arccos(alpha)
    return np.round(angle,2)

find_angle(A, x, y)
```

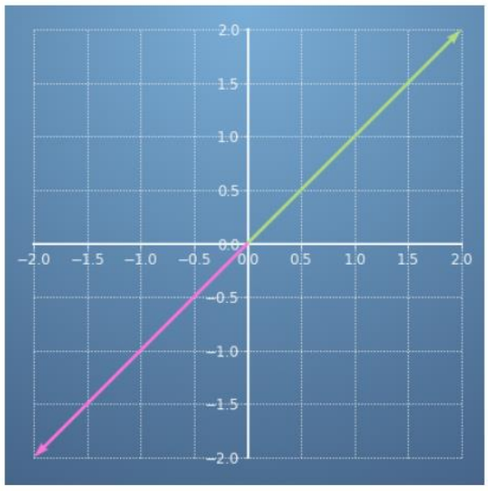
Run

Reset

- (●) 2.69 rad $(154^\circ)$
- ( ) 2.35 rad $(135^\circ)$
- ( ) -0.9 rad $(-52^\circ)$

**Correct**
Well done!

**3.** **1 / 1 point**



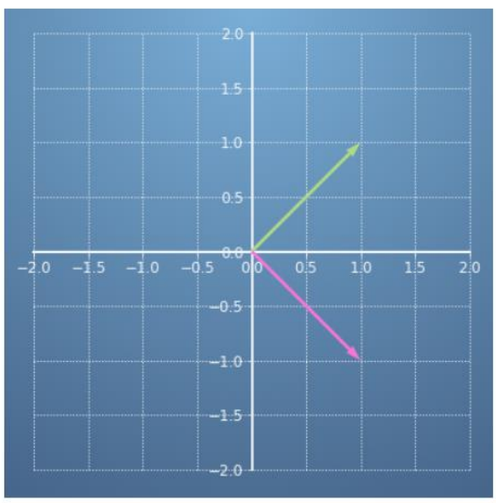

Compute the angle between $\mathbf{x} = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$ and $\mathbf{y} = \begin{bmatrix} -2 \\ -2 \end{bmatrix}$ using the inner product defined by

$$\langle \mathbf{x}, \mathbf{y} \rangle = \mathbf{x}^T \begin{bmatrix} 2 & 1 \\ 1 & 4 \end{bmatrix} \mathbf{y}$$

Using this inner product, are the vectors...

- (●) Antiparallel
- ( ) Parallel

**4.** **1 / 1 point**




Compute the angle between $\mathbf{x} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ and $\mathbf{y} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ using the inner product defined by

$$\langle \mathbf{x}, \mathbf{y} \rangle = \mathbf{x}^T \begin{bmatrix} 1 & 0 \\ 0 & 5 \end{bmatrix} \mathbf{y}$$

```
# Fill in the arrays and use the function `find_angle` defined for you to aid in your c
A = np.array()
x = np.array()
y = np.array()

find_angle(A, x, y)
```

Run

Reset

- 1.57 rad ($90°$)
- -2.3 rad ($-131°$)
- 2.3 rad ($131°$)
- -1.57 rad ($-90°$)

**Correct**
Good job.

5. 1 / 1 point

Compute the angle between $\mathbf{x} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ and $\mathbf{y} = \begin{bmatrix} 2 \\ -1 \\ 0 \end{bmatrix}$ using the inner product defined by

$$\langle \mathbf{x}, \mathbf{y} \rangle = \mathbf{x}^T \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & -1 \\ 0 & -1 & 3 \end{bmatrix} \mathbf{y}$$

```
# Fill in the following arrays and use `find_angle` to aim your calculation.
A = np.array()
x = np.array()
y = np.array()

find_angle(A, x, y)
```

Run

Reset

- 1.37 rad ($78°$)
- 0.2 rad ($11°$)
- 1.31 rad ($75°$)

**Correct**
Well done!