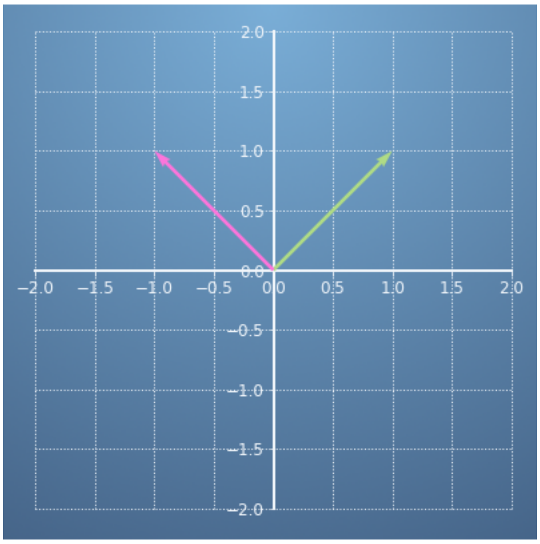
1. **1 / 1 punto**



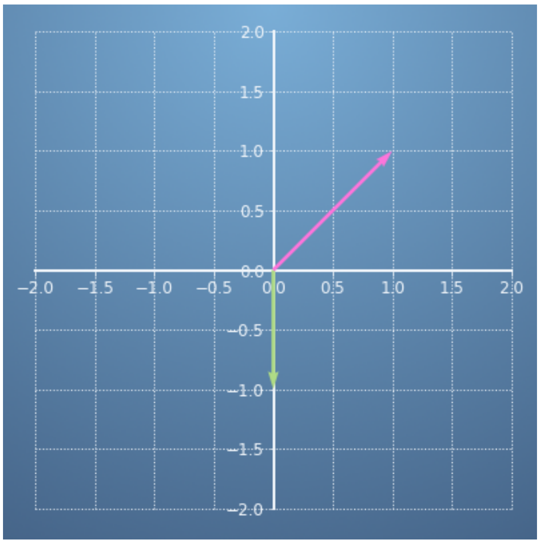
Compute the angle between $\mathbf{x} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ and $\mathbf{y} = \begin{bmatrix} -1 \\ 1 \end{bmatrix}$ using the inner product defined by

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

- (●) 1.2 rad (69°)
- ( ) 0.35 rad (20°)
- ( ) 1.57 rad (90°)

Correcto
Absolutely right!

2. **1 / 1 punto**



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 = x.T @ A @ x
    norm_y = y.T @ A @ y
    alpha = inner_prod/ np.sqrt((norm_x*norm_y))
    angle = np.arccos(alpha)
    return np.round(angle,2)

find_angle(A, x, y)
```

Ejecutar

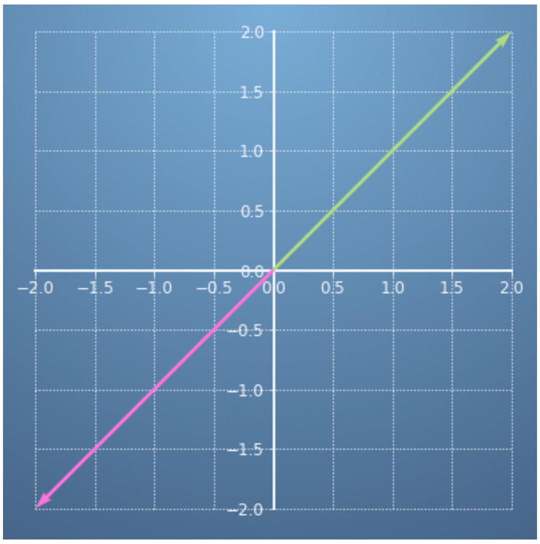
Restablecer

- (x) 2.69 rad (154°)
- ( ) 2.35 rad (135°)
- ( ) -0.9 rad (-52°)

Correcto

Well done!

3. **1 / 1 punto**



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

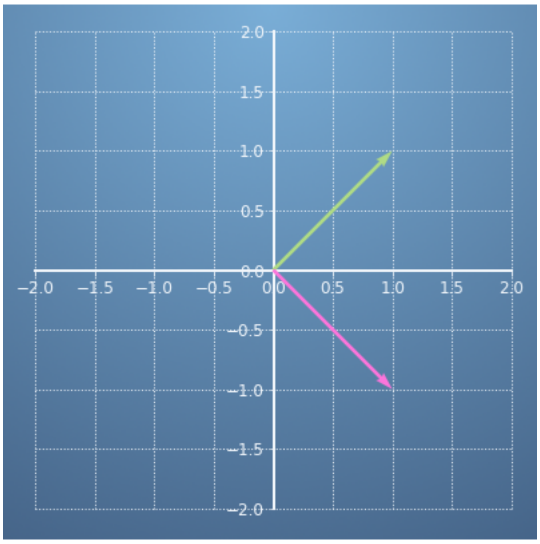
$$\langle \mathbf{x}, \mathbf{y} \rangle = \mathbf{x}^T \begin{bmatrix} 2 & 1 \\ 1 & 4 \end{bmatrix} \mathbf{y}$$

Using this inner product, are the vectors...

- ○ Parallel
- ◉ Antiparallel

Correcto
Well done! The angle between the vectors is $\pi \approx 3.14$.

4. **1 / 1 punto**



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 i
```

```
A = np.array([ [1,0],[0,5]])
x = np.array([[1],[1]])
y = np.array([[1],[-1]])

find_angle(A, x, y)
```

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Restablecer

- ○ -1.57 rad (-90°)
- ◉ 2.3 rad (131°)
- ○ 1.57 rad (90°)
- ○ -2.3 rad (-131°)

Correcto
Good job.

5.

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

1 / 1 punto

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

```
# Fill in the following arrays and use `find_angle` to aim your calculation.
A = np.array([[1,0,0],[0,2,-1],[0,-1,3]])
x = np.array([[1],[1],[1]])
y = np.array([[2],[-1],[0]])

find_angle(A, x, y)
```

Ejecutar

Restablecer

- ○ 0.2 rad (11°)
- ○ 1.31 rad (75°)
- ◉ 1.37 rad (78°)

Correcto
Well done!