## Question 1

Let

$$
A=\left[\begin{array}{ll}
1 & 1 \\
0 & 1
\end{array}\right]
$$

Express $A^{n}$ for every positive integer $n$ as a $2 \times 2$ matrix.

## Question 2

- True or false: Every symmetric matrix can be expressed as a sum of two non-symmetric matrices.
- True or false: if the product of two matrices $A, B$ is a zero matrix, then $A$ or $B$ is also a zero matrix.


## Question 3

Let $B$ be the transformation of the Euclidean plane which rotates every point by $\pi / 2$ radians around the origin.

- Given an arbitrary point $\left(x^{\prime}, y^{\prime}\right)$ in the plane, what are the coordinates of $B\left(\left(x^{\prime}, y^{\prime}\right)\right)$ ?
- Represent $B$ as a matrix.
- Give two conceptually different explanations as to why $B^{4}=I$.


## Question 4

Characterize all $2 \times 2$ matrices $A$ which satisfy $A^{2}=I$.

