

## Homework

**Exercise 1.** Using Cayley—Hamilton theorem to solve the inverse of .

$$A = \begin{bmatrix} 3 & 1 \\ -2 & 0 \end{bmatrix}$$

**Exercise 2.** Calculate  $A^5$  for

$$A = \begin{bmatrix} 2 & 1 & 0 & 0 \\ 0 & 2 & 1 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 3 \end{bmatrix}$$

# Homework

**Exercise 3. Calculate the minimal polynomials of the following matrices**

$$\begin{pmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{pmatrix}, \quad \begin{pmatrix} a & 1 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{pmatrix}, \quad \begin{pmatrix} a & 1 & 0 \\ 0 & a & 1 \\ 0 & 0 & a \end{pmatrix}$$

# Homework

**Exercise 4. Calculate the Jordan Canonic Form of**

$$A = \begin{pmatrix} 2 & -1 & 1 & -1 \\ 2 & 2 & -1 & -1 \\ 1 & 2 & -1 & 2 \\ 0 & 0 & 0 & 3 \end{pmatrix}$$

## Homework

**Exercise 5.**  $A_{n \times n} = \begin{pmatrix} \lambda & 1 & & \\ & \lambda & \dots & \\ & & \dots & 1 \\ & & & \lambda \end{pmatrix}$  solve  $A^k \boxtimes$

**Prove**  $A^k = \begin{pmatrix} \lambda^k & C_k^1 \lambda^{k-1} & C_k^2 \lambda^{k-2} & \dots & C_k^{n-1} \lambda^{k-n+1} \\ 0 & \lambda^k & C_k^1 \lambda^{k-1} & \dots & \dots \\ 0 & 0 & \lambda^k & \dots & C_k^2 \lambda^{k-2} \\ \dots & \dots & \dots & \dots & C_k^1 \lambda^{k-1} \\ 0 & 0 & 0 & \dots & \lambda^k \end{pmatrix} \boxtimes$