

Nombre y apellidos: \_\_\_\_\_

Código: \_\_\_\_\_

### Exercises

Consider the matrix  $\mathbf{A} = \begin{pmatrix} 4 & -2 \\ 1 & 1 \end{pmatrix}$ . Do the following exercises by hand (you can check your results with Matlab).

1. Compute the determinant of the matrix,  $|A|$ .
2. The trace of the matrix.
3. Which of the following matrices is the inverse of  $\mathbf{A}$ ?
  - a.  $\mathbf{A}^{-1} = \begin{pmatrix} 1/4 & -1/2 \\ 1 & 1 \end{pmatrix}$
  - b.  $\mathbf{A}^{-1} = \begin{pmatrix} 4 & 1 \\ -2 & 1 \end{pmatrix}$
  - c.  $\mathbf{A}^{-1} = \begin{pmatrix} 1/6 & 1/3 \\ -1/6 & 2/3 \end{pmatrix}$
  - d.  $\mathbf{A}^{-1} = \begin{pmatrix} 1/4 & 1 \\ -1/2 & 1 \end{pmatrix}$
4. Which of the following vectors is an eigenvector of  $\mathbf{A}$ ? What is the corresponding eigenvalue?
  - a.  $\mathbf{x} = [-1 \ 2]^T$
  - b.  $\mathbf{x} = [2 \ 1]^T$
  - c.  $\mathbf{x} = [0 \ 1]^T$
  - d.  $\mathbf{x} = [1 \ 0]^T$

Consider the matrix  $\mathbf{B} = \begin{pmatrix} 3 & 4 \\ 5 & -1 \end{pmatrix}$

5. Compute  $(AB)^T$ .
6. Compute  $B^T A^T$ .

Consider the vectors  $\mathbf{x} = [1 \ 2 \ 3]^T$  and  $\mathbf{y} = [-1 \ 2 \ 3]^T$

7. Compute the inner (dot) product  $\mathbf{x} \cdot \mathbf{y}$ .
8. Compute the vector (cross) product  $\mathbf{x} \times \mathbf{y}$ .
9. The faces of a 10-sided die are numbered 0 through 9.
  - (9.1) If the die is rolled, what is the probability that the value of the roll is a prime number?
  - (9.2) What is the expected value of the roll?
  - (9.3) If the die is rolled twice, what is the probability that the same number is obtained both times?