Universidad de Oviedo
Dpto. Matemáticas

Linear Algebra
Escuela de Ingeniería Informática
Practice Linear Applications 1
2020 −2021

1. Linear Applications 2

Exercise 1 *Let $f : \mathbb{R}^4 \longrightarrow \mathbb{R}_2[X]$ be the linear application defined as:*

$$\begin{aligned}
f(1,0,0,0) &= 1+x, \\
f(1,1,0,0) &= 2x, \\
f(1,1,1,0) &= -1-x, \\
f(0,0,0,-1) &= 2+3x-x^2.
\end{aligned}$$

a) *Obtain the matrix of the linear transformation f referred to the standard basis of $\mathbb{R}^4$ and $\mathbb{R}_2[X]$, respectively.*

b) *Compute the image of the vector $\vec{v} = (1,-1,1,-2)$.*

c) *Compute the Kernel of f. Is f an injective transformation?*

d) *Compute the Range (image space) of f. Is f a surjective transformation?*

Exercise 2 *Let $f : \mathbb{R}^3 \longrightarrow \mathbb{R}^2$ be a linear transformation such as:*

$$Ker(f) = \langle (1,0,0), (0,1,1) \rangle$$

and $f(0,0,2) = (2,2)$.

Obtain the matrix of the linear transformation f referred to the standard basis of $\mathbb{R}^3$ and $\mathbb{R}^2$, respectively. Compute the image of the vector $\vec{v} = (-1,3,5)$.