October 7, 2019 Lecturer Dmitri Zaitsev

MAU22E01 2019 (SF Engineers & MSISS & MEMS)

S h e e t 4

Due: at the end of the tutorial

Exercise 1

Determine whether the vectors span $\mathbb{R}^3$:

(i) $\mathbf{v}_1 = (-1, 1, 1)$, $\mathbf{v}_2 = (0, -2, 1)$, $\mathbf{v}_3 = (1, 1, 2)$;

(ii) $\mathbf{v}_1 = (-1, 1, 1)$, $\mathbf{v}_2 = (0, -2, 1)$, $\mathbf{v}_3 = (1, 1, -2)$;

Determine whether the vectors span $\mathbb{R}^2$:

(iii) $\mathbf{v}_1 = (1, 2)$, $\mathbf{v}_2 = (1, -1)$, $\mathbf{v}_3 = (-1, 1)$.

Exercise 2

Which of the following sets of vectors are linearly dependent?

(i) $(1, 2)$, $(-1, -2)$;

(ii) $(0, 1, -1)$, $(1, -1, 0)$, $(-1, 0, 1)$;

(iii) $(1, 0, 1, 0, 0)$, $(0, 1, 3, 1, 1)$, $(0, 2, 0, 0, 1)$.

Exercise 3

Which of the following sets of vectors are bases for the corresponding space $\mathbb{R}^n$? (The dimension n should be clear from the length of vectors.)

(i) $(1, 1)$;

(ii) $(1, 0)$, $(1, -1)$;

(iii) $(-1, 1)$, $(2, -2)$;

(iv) $(1, 2)$, $(-15, 2)$, $(-1, -2)$;

(v) $(1, 0, 0, 0)$, $(1, 1, 0, 0)$, $(1, 1, 1, 0)$, $(1, 1, 1, 1)$;

(vi) $(1, 0, 1)$, $(1, 1, 0)$, $(2, 1, 1)$.