

Course 2E01 2015 (SF Engineers & MSISS & MEMS)**S h e e t 4**

Due: at the end of the tutorial

Exercise 1

Which of the following sets of vectors are linearly dependent?

- (i) $(0, 1), (1, -2)$;
- (ii) $(0, 1, 1), (1, -1, 0), (-2, 0, -2)$;
- (iii) $(0, 0, 1, 0, 0), (0, 2, 3, 1, 1), (0, 2, 0, 0, 1)$.

Exercise 2

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) $(-1, 2)$;
- (ii) $(0, 1), (1, 2)$;
- (iii) $(-1, -1), (3, 3)$;
- (iv) $(-1, -1), (15, -12), (-1, 1)$;
- (v) $(1, -1, 2, 0), (1, 1, 5, 3), (1, 3, 2, 1)$;
- (vi) $(1, 0, 1), (1, 1, 0), (2, 1, 0)$.

Exercise 3

Find the coordinates of the vector \mathbf{v} with respect to the basis $\mathbf{v}_1, \dots, \mathbf{v}_n$ (i.e. the coefficients k_1, \dots, k_n in the representation $\mathbf{v} = k_1\mathbf{v}_1 + \dots + k_n\mathbf{v}_n$):

- (i) $\mathbf{v} = (-2, -1), \mathbf{v}_1 = (1, 1), \mathbf{v}_2 = (1, 2)$;
- (ii) $\mathbf{v} = (1, 0, 1, 0), \mathbf{v}_1 = (1, 0, 1, 0), \mathbf{v}_2 = (1, 1, 0, 0), \mathbf{v}_3 = (0, 0, 1, 0), \mathbf{v}_4 = (1, 0, 0, 1)$.