SHANGHAI JIAO TONG UNIVERSITY, UM-SJTU JOINT INSTITUTE

Methods of Applied Mathematics I
HW1

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September 18, 2018

1 EXERCISE1.1

1.

$$\dim U = 2 \tag{1.1}$$

As there are 4 components within x, and 2 constraints.

2.

$$\dim U = 3 \tag{1.2}$$

As there are 4 components within x, and 1 constraint.

3.

$$\begin{aligned} \dim U + V &= \dim U + \dim V - \dim U \cap V \\ &= 2 + 3 - 2 \\ &= 3 \end{aligned} \tag{1.3}$$

The dimension of $U \cap V$ can be observed from

$$\begin{aligned} U \cap V &= \{x \in \mathbb{R}^4 | x_1 + x_2 + x_3 = 0, x_1 + 3x_2 = x_4, x_1 = x_4\} \\ &= \{x \in \mathbb{R}^4 | x_2 = 0, x_1 + x_3 = 0\} \end{aligned} \tag{1.4}$$

2 EXERCISE1.2

3 EXERCISE1.3