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Linear algebra: Homework Week 1, 9/1/2019

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**Ex. (1).**

Say if the set  $S = \{(a, a - b + 1, b - 1) : a, b \in \mathbb{R}\}$  is a vector subspace of  $\mathbb{R}^3$  (with respect to the usual operations of sum and multiplication by a scalar given in  $\mathbb{R}^3$ ) [Hint, put:  $b - 1 = c$ ].

**Ex. (2).**

Say if the set  $S = \{(a, b - a + 1, a - 2b) : a, b \in \mathbb{R}\}$  is a vector subspace of  $\mathbb{R}^3$ .

**Ex. (3).**

Say if the vectors  $\{(1, 2), (2, 3), (3, 4)\}$  of  $\mathbb{R}^2$  are linearly independent and if they are a system of generators for  $\mathbb{R}^2$ . Express the vector  $(0, 1)$  as a linear combination of the vectors  $\{(1, 2), (2, 3), (3, 4)\}$ .

**Ex. (4).**

Let  $W$  be the vector subspace of  $\mathbb{R}^3$  defined by

$$W = \mathcal{L}\{(1, 1, 0), (2, 1, 1)\}$$

- (1) Find the orthogonal projection of the vector  $v = (1, 3, 1)$  on the subspace  $W$ .
- (2) What is the angle between  $v$  and its projection on  $W$  found in (1). ?