

## Excercises for Sect. 1.3

Student

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**1.**

$(e_1 + e_2, e_2 + e_3, e_3 + e_1) = (e_1, e_2, e_3) + (e_2, e_3, e_1)$  and  $(e_1, e_2, e_3)$  spans  $\mathbb{R}^3$  so by Theorem 1.17.4 then  $(e_1 + e_2, e_2 + e_3, e_3 + e_1)$  also spans  $\mathbb{R}^3$ .

**3.**

There are only 3 vectors for a 4 dimensional space so can not fully span the space.

For example the element  $\frac{13t^3}{6} + \frac{7t^2}{12} - \frac{2t}{3} + 1$  cannot be created from any combination of the original elements.

**6.**

??

**9.**

???

**12.**

**a**

$(1,0,0,0), (-1,1,0,0), (0,-1,0,0), (0,0,1,1)$

**b**

First setting  $a = (1,0,0,0)$  and  $b = (0,1,0,0)$  yields  $c = (-5,-2,0,0)$  and  $d = (-7,-4,0,0)$

**c**

Setting  $(a, b, c) = (e_1, e_2, e_3)$  yields  $d = (1/4, -1/2, 3/4, 0)$