

Answer on Question #40011, Math, Linear Algebra

Complete the set  $\{(1,0,2), (2,3,1), (\dots)\}$  to get a basis of  $R^3$ .

Solution.

$$v_1 = (1,0,2)$$

$$v_2 = (2,3,1)$$

$$v_3 = (x, y, z)$$

The best way to guarantee that the vectors are basis is to proof that vectors are orthogonal:

Orthogonal means the dot product  $v_1 \cdot v_2 = 0$ .

$$v_1 \cdot v_3 = x + 2z = 0$$

$$v_2 \cdot v_3 = 2x + 3y + z = 0$$

So you can go ahead and make a choice -- you have two equations, three unknowns, so you're allowed to make a choice. Say  $x = 1$ .

Then

$$z = -2$$

$$y = 0$$

Thus,

$$v_3 = (1, -2, 0)$$

Answer:

$$v_3 = (1, -2, 0)$$