Week03 -HW

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3.1 #19 -

(a) We know that these vectors form a line in 3d space on the first axis because we have 3 elements in each column vector and only one element from each is non zero. In addition each vector is a scalar of the other.

(b) We know that these vectors are a 2d plane in the first two axes of a 3d space because we have 3 elements in each vector and each vector has one non zero value in one of those two axes. We can write these vectors in matrix form as having two pivots indicating that any vector in that plane is achievable.

(c) We know that these vectors form a line in 3d space since one vector is at the origin and the other has only two non zero values, where the value of the 2nd axis has a value of 2 times the first axis.

3.1 #20 -

(a) - We have three unknowns and we can rewrite the equation to look like this and try to solve using elimination.
$1x_1 + 4x_2 + 2x_3 = b_1$
$2x_1 + 8x_2 + 4x_3 = b_2$
$-1x_1 + -4x_2 + -2x_3 = b_3$
Solving for x_1 in equation 1 we get: $x_1 = b_1 - 4x_2 - 2x_3$
plugging this into equation 2 and 3 we get:
2: $2(b_1 - 4_2 - 2_3) + 8_2 + 4_3 = b_2$
reducing to: $2b_1 = b_2$
3: $-1(b_1 - 4x_2 - 2x_3) + -4x_2 + -2_x1 = b_3$
reducing to: $-b_1 = b_2$

(b) - We have two unknowns and we can rewrite the equation to look like this and try to solve using elimination.
$1x_1 + 4x_2 + 2x_3 = b_1$
$2x_1 + 9x_2 + 4x_3 = b_2$
$-1x_1 + -4x_2 + -2x_3 = b_3$
Solving for x in equation 1 we get: $x = b_1 - 4x_2 - 2x_3$
plugging this into equation 2 we are left with $x_2 = b_2$ so this is not solvable leaving the only solution of $b_1 = b_3$ when we plug in the x equivalence into equation 3.