

1. Multiplying a column vector \vec{v}_1 by a real number c_1
- a) scales each entry in \vec{v}_1 by c_1 algebraically, but has no geometric interpretation
 - b) keeps \vec{v}_1 on the same line through the origin and stretches or shrinks it according to the value of c_1 .
 - c) creates the diagonal of the parallelogram formed by \vec{v}_1 and c_1
 - d) has no algebraic nor geometric interpretation
 - e) none of the above

2. What do the collection of column vectors $c_1 \begin{bmatrix} 1 \\ 1 \end{bmatrix} + c_2 \begin{bmatrix} 2 \\ 2 \end{bmatrix}$, for c_1 and c_2 real, have in common?

- a) They are vectors of the form $\begin{bmatrix} c_1 + 2c_2 \\ c_1 + 2c_2 \end{bmatrix}$
- b) They create the diagonals of parallelograms
- c) They form all of \mathbb{R}^2
- d) both a) and b)
- e) both a) and c)

3. Notice that $-1 \begin{bmatrix} 1 \\ 4 \\ 7 \end{bmatrix} + 2 \begin{bmatrix} 2 \\ 5 \\ 8 \end{bmatrix} = \begin{bmatrix} 3 \\ 6 \\ 9 \end{bmatrix}$. More generally, what do the collection of column

vectors $c_1 \begin{bmatrix} 1 \\ 4 \\ 7 \end{bmatrix} + c_2 \begin{bmatrix} 2 \\ 5 \\ 8 \end{bmatrix}$, for c_1 and c_2 real, have in common?

- a) the line connecting the tips of $\begin{bmatrix} 1 \\ 4 \\ 7 \end{bmatrix}$ and $\begin{bmatrix} 2 \\ 5 \\ 8 \end{bmatrix}$
- b) the plane formed by $\begin{bmatrix} 1 \\ 4 \\ 7 \end{bmatrix}$ and $\begin{bmatrix} 2 \\ 5 \\ 8 \end{bmatrix}$
- c) a non-linear curve
- d) a non-linear surface
- e) none of the above

4. We perform the following in Maple:

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s13n15extension:=Matrix([[1,-5,b1],[3,-8,b2],[-1,2,b3]]);
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ReducedRowEchelonForm(s13n15extension);
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and obtain the 3x3 identity $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$. Which of the following are true?

- a) $\begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$ is never in the span of $\begin{bmatrix} 1 \\ 3 \\ -1 \end{bmatrix}$ and $\begin{bmatrix} -5 \\ -8 \\ 2 \end{bmatrix}$
- b) $\begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$ is never a linear combination of $\begin{bmatrix} 1 \\ 3 \\ -1 \end{bmatrix}$ and $\begin{bmatrix} -5 \\ -8 \\ 2 \end{bmatrix}$
- c) $\begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$ is never in the plane formed by $\begin{bmatrix} 1 \\ 3 \\ -1 \end{bmatrix}$ and $\begin{bmatrix} -5 \\ -8 \\ 2 \end{bmatrix}$
- d) all of the above
- e) none of the above

5. For two column vectors \vec{v}_1 and \vec{v}_2 , $\{c_1\vec{v}_1 + \vec{v}_2 \text{ so that } c_1 \text{ is real}\}$ is

- a) a collection of vectors whose tips lie on the line parallel to \vec{v}_1 and through the tip of \vec{v}_2
- b) a collection of vectors whose tips lie on the line parallel to \vec{v}_2 and through the tip of \vec{v}_1
- c) a line because c_1 is free, but we can't say any more about it
- d) has no geometric interpretation
- e) more than one of the above

Solutions

- b)
- a)
- b)
- e) [need to Use Gaussian instead!]
- a)