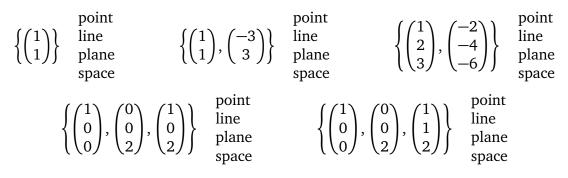
MATH 1553 QUIZ #3: §1.3

Name		Section	
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1. [1 point each] For each of the following sets of vectors, circle the word that describes the span.



Solution.

A nonzero vector spans a line. The second set consists of noncollinear vectors, so it spans a plane. The third set consists of two collinear vectors, so it spans a line. The fourth set consists of three coplanar, noncollinear vectors, which therefore span a plane. The last set spans all of space.

[over]

2. [2 points each] Which of the following vectors are in the span of $\begin{pmatrix} 1 \\ -1 \\ 2 \end{pmatrix}$ and $\begin{pmatrix} 6 \\ 2 \\ -1 \end{pmatrix}$?

a)
$$\begin{pmatrix} 3 \\ 5 \\ 7 \end{pmatrix}$$
 b) $\begin{pmatrix} -3 \\ -5 \\ 7 \end{pmatrix}$ **c**) $\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$

(Show at least a bit of your work.)

Solution.

a) Deciding if $\begin{pmatrix} 3 \\ 5 \\ 7 \end{pmatrix}$ is a linear combination of $\begin{pmatrix} 1 \\ -1 \\ 2 \end{pmatrix}$ and $\begin{pmatrix} 6 \\ 2 \\ -1 \end{pmatrix}$ amounts to row reducing the augmented matrix:

 $\begin{pmatrix} 1 & 6 & | & 3 \\ -1 & 2 & | & 5 \\ 2 & -1 & | & 7 \end{pmatrix} \xrightarrow{\text{row reduce}} \begin{pmatrix} 1 & 6 & | & 3 \\ 0 & 1 & | & 1 \\ 0 & 0 & | & 14 \end{pmatrix}.$

We can stop here, because we can already see that the system is inconsistent, as the last row corresponds to the equation 0 = 14.

b) As before, we row reduce

$$\begin{pmatrix} 1 & 6 & | & -3 \\ -1 & 2 & | & -5 \\ 2 & -1 & | & 7 \end{pmatrix} \xrightarrow{\text{row reduce}} \begin{pmatrix} 1 & 6 & | & -3 \\ 0 & 8 & | & -8 \\ 0 & 0 & | & 0 \end{pmatrix}.$$

We can stop here, because we can already see that the system is consistent. (You weren't asked to find the coefficients in a linear combination.)

c) The zero vector is in any span:

$$\begin{pmatrix} 0\\0\\0 \end{pmatrix} = 0 \begin{pmatrix} 1\\-1\\2 \end{pmatrix} + 0 \begin{pmatrix} 6\\2\\-1 \end{pmatrix}.$$