RH 1.3

MATH 5, Jones

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1 Refrigerator Homework

Practice Problem 3

Let w_1, w_2, w_3, u, v be vectors in $\mathbb{R}^n$. Suppose the vectors **u** and **v** are in Span w_1, w_2, w_3 g. Show that $u + v$ is also in Span w_1, w_2, w_3

Since u and v exist in Span w_1, w_2, w_3, there must bc constants x_n for u and y_n for v where $u = \sum_{m=1}^{n} x_m w_m$ and $v = \sum_{m=1}^{n} y_m w_m$. With this, $u+v = x_1w_1+x_2w_2+x_3w_3+y_1w_1+y_2w_2+y_3w_3 = (y_1+x_1)w_1+(y_2+x_2)w_2+(y_3+x_3)w_3$
Since all three of those coefficients are scalar quantities, $\boxed{u + v \text{ is in Span } w_1, w_2, w_3}$

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$a_1 = \begin{bmatrix} 1 \\ 4 \\ -2 \end{bmatrix}$ $a_2 = \begin{bmatrix} -2 \\ -3 \\ 7 \end{bmatrix}$ $b = \begin{bmatrix} 4 \\ 1 \\ h \end{bmatrix}$ for what value(s) of h is b in the plane spanned by a_1 and a_2?

$a_1 - 2a_2 = 4 \qquad 4a_1 - 3a_2 = 1$
$5a_2 = -15 \to a_2 = -3$
$a_1 + 6 = 4 \to a_1 = -2$
$-2(-2) + -3(7) = h \to \boxed{h = -17}$

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$-2c_1 + 2c_2 = h$
$c_1 + c_2 = k$
Second equation:
$c_1 = k - c_2$
Substituting into the first equation:
$-2(k - c_2) + 2c_2 = h \to -2k + 2c_2 + 2c_2 = h$
$-2k + 4c_2 = h \to c_2 = \frac{h + 2k}{4}$
Substituting back:
$c_1 = k - \frac{h + 2k}{4} = \frac{4k - h - 2k}{4}$
$c_1 = \frac{2k - h}{4}$
Since division by 0 never occurs and the system always has solutions for any h and k, it follows that the span of **u** and **v** covers the entire $\mathbb{R}^2$, meaning they form a basis for $\mathbb{R}^2$.

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T/F $\begin{bmatrix} -4 \\ 3 \end{bmatrix} \equiv [-4\ 3]$ is **false**. Row vectors and column vectors have different meanings in the way they are read and are only equivalent when marked as transposed

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T/F (-2,5) and (-5,2) lie on a line passing through the origin. This statement is **false** as the line equation is $y = x + 7$ and (0,0 is not a solution)

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a: No, 3

b: $\begin{bmatrix} 1 & 0 & -4 & 4 \\ 0 & 3 & -2 & 1 \\ -2 & 6 & 3 & -4 \end{bmatrix}$

$R_3+ = 2R_1 \rightarrow \begin{bmatrix} 1 & 0 & -4 & 4 \\ 0 & 3 & -2 & 1 \\ 0 & 6 & -5 & 4 \end{bmatrix}$

$R_3- = 2R_2 \rightarrow \begin{bmatrix} 1 & 0 & -4 & 4 \\ 0 & 3 & -2 & 1 \\ 0 & 0 & 1 & 2 \end{bmatrix}$

$R_1+ = 4R_3$ and $R_2+ = 2R_3 \rightarrow \begin{bmatrix} 1 & 0 & 0 & 12 \\ 0 & 3 & 0 & 5 \\ 0 & 0 & 1 & 2 \end{bmatrix}$

$R_2/ = 3 \rightarrow \begin{bmatrix} 1 & 0 & 0 & 12 \\ 0 & 1 & 0 & 5/3 \\ 0 & 0 & 1 & 2 \end{bmatrix}$ Yes **b** is in W and there are an infinite number of vectors in W

c: $a_1 = 1 \cdot a_1 + 0a_2 + 0a_3$ ✓

Computer Homework

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