HW 2.1 : 9-17

9.

a) $\begin{bmatrix} 1 & 2 & 4 \\ -2 & 3 & 1 \\ -4 & 1 & 2 \end{bmatrix}\begin{bmatrix} 2 \\ 2 \\ 3 \end{bmatrix} = \begin{bmatrix} 2+4+12 \\ -4+6+3 \\ -8+2+6 \end{bmatrix} = \begin{bmatrix} 18 \\ 5 \\ 0 \end{bmatrix}$

b) $\begin{bmatrix} 2 & 1 & 0 & 0 \\ 1 & 2 & 1 & 0 \\ 0 & 1 & 2 & 1 \\ 0 & 0 & 1 & 2 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 2 \end{bmatrix}$

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10. You get the same results as in 9. You give it a shot

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11. $\begin{bmatrix} 2 & 3 \\ 5 & 1 \end{bmatrix}\begin{bmatrix} 4 \\ 2 \end{bmatrix} = \begin{bmatrix} 8+6 \\ 20+2 \end{bmatrix} = \begin{bmatrix} 14 \\ 22 \end{bmatrix}$

$\begin{bmatrix} 3 & 6 \\ 6 & 12 \end{bmatrix}\begin{bmatrix} 2 \\ -1 \end{bmatrix} = 2\begin{bmatrix} 3 \\ 6 \end{bmatrix} - \begin{bmatrix} 6 \\ 12 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

$\begin{bmatrix} 1 & 2 & 4 \\ 2 & 0 & 1 \end{bmatrix}\begin{bmatrix} 3 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 3+2+4 \\ 6+0+1 \end{bmatrix} = \begin{bmatrix} 9 \\ 7 \end{bmatrix}$

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12. $\begin{bmatrix} z \\ y \\ x \end{bmatrix}, \begin{bmatrix} 2+1-3 \\ 1+2-3 \\ 3+3-6 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

$\begin{bmatrix} 2 & 1 \\ 1 & 2 \\ 3 & 3 \end{bmatrix}\begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 2+1 \\ 1+2 \\ 3+3 \end{bmatrix} = \begin{bmatrix} 3 \\ 3 \\ 6 \end{bmatrix}$

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13. $A\underset{\wedge}{x} = \underset{\wedge}{b}$.

(a) If A is $m \times n$, x has n-components while b has m components.
See examples above in 11 & 12.

(b) $A\underset{\wedge}{x} = \underbrace{\begin{bmatrix} a_{11}x_1 + a_{12}x_2 + \cdots a_{1n}x_n \\ \vdots \\ a_{m1}x_1 + \cdots + a_{mn}x_n \end{bmatrix}}$
These define planes in n-space.

$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ \vdots & \vdots & & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix}$

The columns of A are in m-space thus so is the combination of its columns.

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14. $\begin{bmatrix} 2 & 3 & 1 & 5 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \\ t \end{bmatrix} = 8$

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15 a) $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

b) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

16 a) $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$

b) $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$

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17. $P = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}, Q = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$