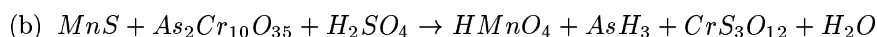
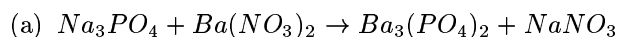


MATH122 200610 Problem Set 4

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Wednesday, February 1, 2006

1. (Based on 1.6.6 and 1.6.10.) Balance the following chemical equations.



2. (Based on 1.7.2, 1.7.6, and 1.7.8.) Determine whether the columns of each of the following matrices are linearly independent.

(a) $\begin{bmatrix} 0 & 0 & -3 \\ 0 & 5 & 4 \\ 2 & -8 & 1 \end{bmatrix}$

(b) $\begin{bmatrix} -4 & -3 & 0 \\ 0 & -1 & 4 \\ 1 & 0 & 3 \\ 5 & 4 & 6 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & -3 & 3 & -2 \\ -3 & 7 & -1 & 2 \\ 0 & 1 & -4 & 3 \end{bmatrix}$

3. (Based on 1.7.32.) For each of the above matrices A , if the columns are not linearly independent, find a non-trivial solution to the equation $A\mathbf{x} = \mathbf{0}$.
4. (Based on 1.7.10, 1.7.12, and 1.7.14.) Find the value or values of h for which the following sets of vectors are linearly dependent.

(a) $\begin{bmatrix} 1 \\ -5 \\ -3 \end{bmatrix}, \begin{bmatrix} -2 \\ 10 \\ 6 \end{bmatrix}, \begin{bmatrix} 2 \\ -9 \\ h \end{bmatrix}$

(b) $\begin{bmatrix} 2 \\ -4 \\ 1 \end{bmatrix}, \begin{bmatrix} -6 \\ 7 \\ -3 \end{bmatrix}, \begin{bmatrix} 8 \\ h \\ 4 \end{bmatrix}$

(c) $\begin{bmatrix} 1 \\ -1 \\ -3 \end{bmatrix}, \begin{bmatrix} -5 \\ 7 \\ 8 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ h \end{bmatrix}$

5. (Based on 1.7.16, 1.7.18, and 1.7.20.) Determine by inspection whether each of the following sets of vectors is linearly independent. Justify your answer.

(a) $\begin{bmatrix} 4 \\ -2 \\ 6 \end{bmatrix}, \begin{bmatrix} 6 \\ -3 \\ 9 \end{bmatrix}$

(b) $\begin{bmatrix} 4 \\ 4 \end{bmatrix}, \begin{bmatrix} -1 \\ 3 \end{bmatrix}, \begin{bmatrix} 2 \\ 5 \end{bmatrix}, \begin{bmatrix} 8 \\ 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 \\ 4 \\ -7 \end{bmatrix}, \begin{bmatrix} -2 \\ 5 \\ 3 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

Other problems which will help you learn the material can be found in section 1.6, exercises 5–10 (try the odd numbers first), and in section 1.7, practice problems 1–4 and exercises 1–20 (again, try the odd numbers first). Students who would like obtain an A in the course should also try exercises 1.7.23–44.