MA322-001 Jan 24 worksheet

Stoichiometry!

(a) Balance this reaction:
$$C_3H_8 + O_2 \rightarrow CO_2 + H_2O$$

(b) Find scalars x_1, x_2, x_3 , and x_4 (not all zero) so that $\underbrace{x_1}_{x_1} \begin{bmatrix} 3\\8\\0 \end{bmatrix} + \underbrace{x_2}_{x_2} \begin{bmatrix} 0\\0\\2 \end{bmatrix} = \underbrace{x_3}_{x_3} \begin{bmatrix} 1\\0\\2 \end{bmatrix} + \underbrace{x_4}_{x_4} \begin{bmatrix} 0\\2\\1 \end{bmatrix}$

- (c) Solve the equations $\begin{cases} 3x_1 = x_3 \\ 8x_2 = 2x_4 \\ 2x_2 = 2x_3 + x_4 \end{cases}$
- (d) Row reduce this matrix:

$$\begin{bmatrix} 3 & 0 & -1 & -0 & | & 0 \\ 8 & 0 & -0 & -2 & | & 0 \\ 0 & 2 & -2 & -1 & | & 0 \end{bmatrix}$$

Hint:
$$\begin{bmatrix} 3 & 0 & -1 & -0 & | & 0 \\ 8 & 0 & -0 & -2 & | & 0 \\ 0 & 2 & -2 & -1 & | & 0 \end{bmatrix} \xrightarrow{R_1/3, R_3/2}_{R_2 - (8/3)R_1} \begin{bmatrix} 1 & 0 & -1/3 & 0 & | & 0 \\ 0 & 0 & 8/3 & -2 & | & 0 \\ 0 & 1 & -1 & -1/2 & | & 0 \end{bmatrix} \xrightarrow{R_1 + (1/3)R_3}_{R_2 + R_3} \begin{bmatrix} 1 & 0 & -1/4 & | & 0 \\ 0 & 1 & -1 & -1/2 & | & 0 \\ 0 & 0 & 1 & -3/4 & | & 0 \end{bmatrix}$$

(e) What is the general solution?

(f) What is a non-zero solution with all integers?

MA322-001 Jan 24 quiz

Name:_____

1.3.1 (HW1.3#11/13) Determine if b is a linear combination of the columns of the matrix A. If it is, write out the linear combination; if not, explain why not.

$$A = \begin{bmatrix} 1 & 0 & 5 \\ -2 & 1 & -6 \\ 0 & 2 & 8 \end{bmatrix} \qquad b = \begin{bmatrix} 2 \\ -1 \\ 6 \end{bmatrix}$$

1.3.2 Write a vector equation that is equivalent to the following system of equations:

 $\left\{\begin{array}{c} x_2 + 5x_3 = 0\\ 4x_1 + 6x_2 - x_3 = 0\\ -x_1 + 3x_2 - 8x_3 = 0\end{array}\right\}$

1.4.1 Write a matrix equation (of the form Ax = b for x, b vectors and A a matrix) for that same system.

You should get this back on Mon Jan 27. The following note is for you to read then: Before next class (Wed Jan 29) (a) reread 1.5 and fix your notes, (b) get your questions ready for next class, and (c) do HW1.5 #1, 3, 5, 7, 11, 13, 15, 19, 21.