RH 1.6

MATH 5, Jones

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Refrigerator Homework

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$$\begin{cases} p_s = 0.8p_g + 0.3p_s \\ p_g = 0.2p_g - 0.7p_s \end{cases} \rightarrow \begin{bmatrix} 0.8 & 0.3-1 & 0 \\ 0.2-1 & 0.7 & 0 \end{bmatrix} \rightarrow \begin{bmatrix} 0.8 & -0.7 \\ -0.8 & 0.7 \end{bmatrix} \begin{bmatrix} p_g \\ p_s \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$0.8p_g = 0.7p_s \Rightarrow \boxed{p_g = \frac{7}{8}p_s}$

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a: $\begin{bmatrix} & A & E & M & T \\ A & 0.65 & 0.3 & 0.3 & 0.2 \\ E & 0.1 & 0.1 & 0.15 & 0.1 \\ M & 0.25 & 0.35 & 0.15 & 0.3 \\ T & 0 & 0.25 & 0.4 & 0.4 \end{bmatrix}$

b: Equations: $p_A = 0.65p_A + 0.30p_E + 0.30p_M + 0.20p_T \quad p_E = 0.10p_A + 0.10p_E + 0.15p_M + 0.10p_T$
$p_M = 0.25p_A + 0.35p_E + 0.15p_M + 0.30p_T \quad p_T = 0.25p_E + 0.40p_M + 0.40p_T$
$0.35p_A - 0.30p_E - 0.30p_M - 0.20p_T = 0 \quad -0.10p_A + 0.90p_E - 0.15p_M - 0.10p_T = 0$
$-0.25p_A - 0.35p_E + 0.85p_M - 0.30p_T = 0 \quad -0.25p_E - 0.40p_M + 0.60p_T = 0$

As a matrix: $\begin{bmatrix} 0.35 & -0.30 & -0.30 & -0.20 & 0 \\ -0.10 & 0.90 & -0.15 & -0.10 & 0 \\ -0.25 & -0.35 & 0.85 & -0.30 & 0 \\ 0 & -0.25 & -0.40 & 0.60 & 0 \end{bmatrix}$

RREF using the Wolfram Compute Engine: $\begin{bmatrix} 1 & 0 & 0 & -2.02786 & 0 \\ 0 & 1 & 0 & -0.531105 & 0 \\ 0 & 0 & 1 & -1.16806 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

$p_A = 2.03p_T, \quad p_E = 0.53p_T, \quad p_M = 1.17p_T$
$p_A = 203, \quad p_E = 53, \quad p_M = 117$

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$$\mathrm{Na_3PO_4}:\begin{bmatrix}3\\1\\4\\0\\0\end{bmatrix},\quad \mathrm{Ba(NO_3)_2}:\begin{bmatrix}0\\0\\6\\1\\2\end{bmatrix},\quad \mathrm{Ba_3(PO_4)_2}:\begin{bmatrix}0\\2\\8\\3\\0\end{bmatrix},\quad \mathrm{NaNO_3}:\begin{bmatrix}1\\0\\3\\0\\1\end{bmatrix}\quad\begin{matrix}\text{sodium}\\\text{phosphorus}\\\text{oxygen}\\\text{barium}\\\text{nitrogen}\end{matrix}$$

Row reduced: $\begin{bmatrix}1&0&0&-\frac{1}{3}&0\\0&1&0&-\frac{1}{2}&0\\0&0&1&-\frac{1}{6}&0\\0&0&0&0&0\\0&0&0&0&0\end{bmatrix}$ $\rightarrow 2\mathrm{Na_3PO_4}+3\mathrm{Ba(NO_3)_2}\rightarrow \mathrm{Ba_3(PO_4)_2}+6\mathrm{NaNO_3}$

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$$\mathrm{NaHCO_3}:\begin{bmatrix}1\\1\\1\\3\end{bmatrix},\quad \mathrm{H_3C_6H_5O_7}:\begin{bmatrix}0\\8\\6\\7\end{bmatrix},\quad \mathrm{Na_3C_6H_5O_7}:\begin{bmatrix}3\\5\\6\\7\end{bmatrix},\quad \mathrm{H_2O}:\begin{bmatrix}0\\2\\0\\1\end{bmatrix},\quad \mathrm{CO_2}:\begin{bmatrix}0\\0\\1\\2\end{bmatrix}\quad\begin{matrix}\text{sodium}\\\text{hydrogen}\\\text{carbon}\\\text{oxygen}\end{matrix}$$

$\begin{bmatrix}1&0&-3&0&0&0\\1&8&-5&-2&0&0\\1&6&-6&0&-1&0\\3&7&-7&-1&-2&0\end{bmatrix}$ Becomes $\begin{bmatrix}1&0&0&0&-1&0\\0&1&0&0&-1/3&0\\0&0&1&0&-1/3&0\\0&0&0&1&-1&0\end{bmatrix}$ when row reduced making the equation

$$3\mathrm{NaHCO_3}+\mathrm{H_3C_6H_5O_7}\rightarrow \mathrm{Na_3C_6H_5O_7}+3\mathrm{H_2O}+3\mathrm{CO_2}$$

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$$\begin{array}{rcrcrcl} x_1 & & - & x_3 & - & x_4 & = 40\\ x_1 & + & x_2 & & & & = 200\\ & x_2 & + & x_3 & - & x_5 & = 100\\ & & & x_4 & + & x_5 & = 60 \end{array}$$

$\begin{bmatrix}1&0&-1&-1&0&40\\1&1&0&0&0&200\\0&1&1&0&-1&100\\0&0&0&1&1&60\end{bmatrix}$ becomes $\begin{bmatrix}1&0&-1&0&1&100\\0&1&1&0&-1&100\\0&0&0&1&1&60\\0&0&0&0&0&0\end{bmatrix}$ when row reduced

Computer Homework

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On next page. Im sick and dont feel like typing out the latex

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