Homework 6, Section 1.6: 8, 13, 14

Alex Gordon

February 3, 2014

Homework

8.

Converting this equation to an augmented matrix results in the form:

$$\begin{bmatrix} 3 & 0 & -2 & 0 & 0 & 0 \\ 0 & -9 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & -9 & 6 & 0 \\ 0 & 0 & 0 & -9 & 9 & 0 \end{bmatrix}$$

Then, converting into equations we realize that x_5 is the free variable. The other variables are:
$x_4 = x_5$
$x_3 = 3x_5$
$x_2 = x_5$
$x_1 = 2x_5$ Since the coefficients must be integers, the equation results in
$2H_3O + CaCO_3 \rightarrow 3H_2O + Ca + CO_2$

13. A)

Writing the equations as Node = Flow in = Flow out
$A = x_2 + 30 = x_1 + 80$
$B = x_3 + x_5 = x_2 + x_4$
$C = x_6 + 100 = x_5 + 40$
$D = x_4 + 40 = x_6 + 90$
$E = x_1 + 60 = x_3 + 20$
Total Flow = 230 = 230
Solving these equations, we get
$x_1 = x_3 - 40$
$x_2 = x_3 + 10$
$x_4 = x_6 + 50$
$x_5 = x_6 + 60$
x_3, x_6 are free

14.

Converting this equation to an RREF matrix results in the form:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 80 \\ 0 & 1 & 0 & -1 & -1 & -180 \\ 0 & 0 & 1 & -1 & -1 & 90 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

14. A)

$x_1 = 80 - x_5$
$x_2 = x_4 + x_5 - 180$
$x_3 = x_4 + x_5 - 90$
$x_4 = x_4$
$x_5 = x_5$

14. B)

$x_1 = 80$
$x_2 = x_4 - 180$
$x_3 = x_4 - 90$
$x_4 = x_4$

14. C)

180