

Day 1 Math 204

#1 a and c are linear

(b) fails because of $\sqrt{x_3}$

(d) fails because of $\frac{1}{x_1}$

e) fails because of $x_1 x_2$

f) fails because of $6x_2^2$

#2

$$\begin{array}{l} x_2 + 5x_3 = -4 \\ x_1 + 4x_2 + 3x_3 = -2 \\ 2x_1 + 7x_2 + x_3 = -2 \end{array} \xrightarrow{R_2 \leftrightarrow R_1} \begin{array}{l} x_1 + 4x_2 + 3x_3 = -2 \\ x_2 + 5x_3 = -4 \\ 2x_1 + 7x_2 + x_3 = -2 \end{array} \xrightarrow{R_3 - 2R_1 \rightarrow R_3} \begin{array}{l} x_1 + 4x_2 + 3x_3 = -2 \\ x_2 + 5x_3 = -4 \\ -x_2 - 5x_3 = 2 \end{array}$$

$R_3 + R_2 \rightarrow R_3$

$$\begin{array}{l} x_1 + 4x_2 + 3x_3 = -2 \\ x_2 + 5x_3 = -4 \\ 0 = -2 \end{array}$$

The system is inconsistent.
stop

#3

$$\text{p10 \#14} \begin{bmatrix} 2 & 0 & -6 & -8 \\ 0 & 1 & 2 & 3 \\ 3 & 6 & -2 & -4 \end{bmatrix} \xrightarrow{\frac{1}{2}R_1 \rightarrow R_1} \begin{bmatrix} 1 & 0 & -3 & -4 \\ 0 & 1 & 2 & 3 \\ 3 & 6 & -2 & -4 \end{bmatrix} \xrightarrow{R_2 - 3R_3 \rightarrow R_3} \begin{bmatrix} 1 & 0 & -3 & -4 \\ 0 & 1 & 2 & 3 \\ 0 & 6 & 7 & 8 \end{bmatrix} \xrightarrow{R_3 - 6R_2 \rightarrow R_3}$$

$$\begin{bmatrix} 1 & 0 & -3 & -4 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & -5 & -10 \end{bmatrix} \xrightarrow{\frac{1}{5}R_3 \rightarrow R_3} \begin{bmatrix} 1 & 0 & -3 & -4 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 1 & 2 \end{bmatrix} \xrightarrow{R_2 - 2R_3 \rightarrow R_2} \begin{bmatrix} 1 & 0 & -3 & -4 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 2 \end{bmatrix} \xrightarrow{R_1 + 3R_3 \rightarrow R_1}$$

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

Solution: $x_1 = 2$
 $x_2 = -1$
 $x_3 = 2$ or $(2, -1, 2)$