6.1 (1) $(A,b)=$

$$\begin{pmatrix}1&-2&3\\2&1&4\end{pmatrix}\xrightarrow{-2r_1+r_2}\begin{pmatrix}1&-2&3\\0&5&-2\end{pmatrix}\Rightarrow\begin{cases}x_2=-\frac{2}{5}\\ x_1=3+2x_2=3-\frac{4}{5}=\frac{11}{5}\end{cases}$$

(2) $(A,b)=\begin{pmatrix}3&-1&2&-3\\1&1&1&-4\\2&1&-1&-3\end{pmatrix}\Rightarrow\begin{pmatrix}1&-\frac{1}{3}&\frac{2}{3}&-1\\0&\frac{4}{3}&\frac{1}{3}&-3\\0&\frac{5}{3}&-\frac{7}{3}&-1\end{pmatrix}\to\begin{pmatrix}1&-\frac{1}{3}&\frac{2}{3}&-1\\0&1&\frac{1}{4}&-\frac{9}{4}\\0&0&-\frac{1}{4}&\frac{1}{4}\end{pmatrix}$

$$\Rightarrow\begin{cases}x_3=-1\\ x_2=-\frac{9}{4}-\frac{1}{4}x_3=-2\\ x_1=-1+\frac{1}{3}x_2-\frac{2}{3}x_3=-1\end{cases}$$

6.2 (1)

$$(A,b)=\begin{pmatrix}1&-1&1&-4\\5&-4&3&-12\\2&1&1&11\end{pmatrix}\xrightarrow{r_1\leftrightarrow r_2}\begin{pmatrix}5&-4&3&-12\\1&-1&1&-4\\2&1&1&11\end{pmatrix}\to\begin{pmatrix}1&-\frac{4}{5}&\frac{3}{5}&-\frac{12}{5}\\0&-\frac{1}{5}&\frac{2}{5}&-\frac{28}{5}\\0&\frac{13}{5}&-\frac{1}{5}&\frac{79}{5}\end{pmatrix}$$

$$\xrightarrow{r_2\leftrightarrow r_3}\begin{pmatrix}1&-\frac{4}{5}&\frac{3}{5}&-\frac{12}{5}\\0&\frac{13}{5}&-\frac{1}{5}&\frac{79}{5}\\0&-\frac{1}{5}&\frac{2}{5}&-\frac{28}{5}\end{pmatrix}\to\begin{pmatrix}1&-\frac{4}{5}&\frac{3}{5}&-\frac{12}{5}\\0&1&-\frac{1}{13}&\frac{79}{13}\\0&0&\frac{5}{13}&-\frac{5}{13}\end{pmatrix}$$

$$\Rightarrow\begin{cases}x_3=-1\\ x_2=\frac{79}{13}+\frac{1}{13}x_3=6\\ x_1=-\frac{12}{5}+\frac{4}{5}x_2-\frac{3}{5}x_3=3\end{cases}$$

(2) $(A,b)=\begin{pmatrix}2&3&5&5\\3&4&7&6\\1&3&3&5\end{pmatrix}\xrightarrow{r_1\leftrightarrow r_2}\begin{pmatrix}3&4&7&6\\2&3&5&5\\1&3&3&5\end{pmatrix}\to\begin{pmatrix}1&\frac{4}{3}&\frac{7}{3}&2\\0&\frac{1}{3}&\frac{1}{3}&1\\0&\frac{5}{3}&\frac{2}{3}&3\end{pmatrix}$

$$\xrightarrow{r_2\leftrightarrow r_3}\begin{pmatrix}1&\frac{4}{3}&\frac{7}{3}&2\\0&\frac{5}{3}&\frac{2}{3}&3\\0&\frac{1}{3}&\frac{1}{3}&1\end{pmatrix}\to\begin{pmatrix}1&\frac{4}{3}&\frac{7}{3}&2\\0&1&\frac{2}{5}&\frac{9}{5}\\0&0&\frac{1}{5}&\frac{2}{5}\end{pmatrix}\Rightarrow\begin{cases}x_3=2\\ x_2=\frac{9}{5}-\frac{2}{5}x_3=1\\ x_1=2-\frac{4}{3}x_2-\frac{7}{3}x_3=-4\end{cases}$$