7. (a) Invert $A = \begin{pmatrix} 2 & 2 & -6 \\ -4 & -5 & 14 \\ 4 & 3 & -9 \end{pmatrix}$.

$A^{-1} = \begin{pmatrix} -3/2 & 0 & 1 \\ -10 & -3 & 2 \\ -4 & -1 & 1 \end{pmatrix}$

$\begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -2 & 0 & 1 \end{pmatrix} \begin{pmatrix} 2 & 2 & -6 \\ \boxed{-4} & -5 & 14 \\ \boxed{4} & 3 & -9 \end{pmatrix} \left| \begin{matrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{matrix} \right.$

$\begin{pmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 0 & -1 & 1 \end{pmatrix} \begin{pmatrix} 2 & \boxed{2} & -6 \\ 0 & -1 & 2 \\ 0 & \boxed{-1} & 3 \end{pmatrix} \left| \begin{matrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -2 & 0 & 1 \end{matrix} \right.$

$\begin{pmatrix} 1 & 0 & 2 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 2 & 0 & \boxed{-2} \\ 0 & -1 & \boxed{2} \\ 0 & 0 & 1 \end{pmatrix} \left| \begin{matrix} 5 & 2 & 0 \\ 2 & 1 & 0 \\ -4 & -1 & 1 \end{matrix} \right.$

$\begin{pmatrix} 1/2 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 2 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \left| \begin{matrix} -3 & 0 & 2 \\ 10 & 3 & -2 \\ -4 & -1 & 1 \end{matrix} \right.$

$\left(\begin{matrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{matrix} \right| \left. \begin{matrix} -3/2 & 0 & 1 \\ -10 & -3 & 2 \\ -4 & -1 & 1 \end{matrix} \right)$

(b) Does $A = \begin{pmatrix} -1 & 2 \\ 2 & -4 \end{pmatrix}$ have an inverse? Justify your answer.

determinate? $\left| \begin{pmatrix} a & b \\ c & d \end{pmatrix} \right| = ad - bc$

$(-1)(-4) - 2 \cdot 2$

$= 0$

A does not have an inverse since $\det A = 0$.