

12.4.

To interchange the first and second columns,

$$ME = \begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$
$$= \begin{pmatrix} b & a \\ d & c \end{pmatrix}$$

To scale the first column by s_1 and the second by s_2 , we do

$$ME = \begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} s_1 & 0 \\ 0 & s_2 \end{pmatrix}$$
$$= \begin{pmatrix} s_1 a & s_2 b \\ s_1 c & s_2 d \end{pmatrix}$$

Lastly, to scale the first column by s_1 and add it to the second, we do

$$ME = \begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 1 & s_1 \\ 0 & 1 \end{pmatrix}$$
$$= \begin{pmatrix} a & s_1 a + b \\ c & s_1 c + d \end{pmatrix}$$

And likewise to scale the second column by s and add it to the first we do

$$ME = \begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 1 & 0 \\ s & 1 \end{pmatrix}$$
$$= \begin{pmatrix} a + bs & b \\ c + sd & d \end{pmatrix}$$