How to reduce Row Echelon Form, the determinant is changed here Three Axioms for determinant function:

- . Exchange two different rows det $A = (-1) \det A$
- 2. Multiply one row with non-zero scalar det $A = n \det A$
- 3. Multiply one row with non-zero scalar and add it to other row det $A = \det A$

Determinant function is linear function in any one column given that the rest of columns are fixed

$$\det \begin{vmatrix} a+a' & b \\ c+c' & d \end{vmatrix} = \det \begin{vmatrix} a & b \\ c & d \end{vmatrix} + \det \begin{vmatrix} a' & b \\ c' & d \end{vmatrix}$$

duplicated n-1 copy of first row

$$nap(\x -> head A) A$$

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 10 \end{bmatrix} \Rightarrow B = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \end{bmatrix}$$

init A

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 10 \end{bmatrix} \Rightarrow C = \begin{bmatrix} 4 & 5 & 6 \\ 7 & 8 & 10 \end{bmatrix}$$

remove first row

tail A

$$\begin{bmatrix} 4(1 & 2 & 3) \\ 7(1 & 2 & 3) \end{bmatrix} - \begin{bmatrix} 1(4 & 5 & 6) \\ 1(7 & 8 & 10) \end{bmatrix} \Rightarrow D = \begin{bmatrix} 0 & 3 & 6 \\ 0 & 9 & 11 \end{bmatrix}$$

Zero the first column

 $map(\x -> tail x) D$

$$\begin{bmatrix} 3 & 6 \\ 9 & 11 \end{bmatrix} \Rightarrow \begin{bmatrix} 3 & 6 \end{bmatrix}$$
$$\begin{bmatrix} 3 & 6 \\ 9 & 11 \end{bmatrix} \Rightarrow \begin{bmatrix} 9 & 11 \end{bmatrix}$$
$$\begin{bmatrix} 9(3 & 6) \end{bmatrix} - \begin{bmatrix} 3(9 & 11) \end{bmatrix} = \begin{bmatrix} 0 & 21 \end{bmatrix}$$

Final matrix

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 3 & 6 \\ 0 & 0 & 21 \end{bmatrix}$$