1. a) $A = \begin{bmatrix} -1 & 0 \\ 0 & 3 \end{bmatrix}_{2\times 2}$ $\quad E = \begin{bmatrix} -2 & 0 \\ 1 & -5 \\ 0 & 1 \end{bmatrix}_{3\times 2}$

$2 \neq 3$

AE: impossível

b) $EA = \begin{bmatrix} e_{11} & e_{12} \\ e_{21} & e_{22} \\ e_{31} & e_{32} \end{bmatrix}_{3\times 2}$

$e_{11} = (-2)\times(-1) + 0\times 0 = 2$
$e_{12} = (-2)\times 0 + (-0)\times 3 = 0$
$e_{21} = 1\times(-1) + 0\times(-5) = -1$
$e_{22} = 1\times 0 + (-5)\times 3 = -15$
$e_{31} = 0\times(-1) + 1\times 0 = 0$
$e_{32} = 0 + 0 + 1\times 3 = 3$

$\begin{bmatrix} 2 & 0 \\ -1 & -15 \\ 0 & 3 \end{bmatrix}$

c) Não

d) $AC = \begin{bmatrix} -1 & 0 \\ 0 & 6 \end{bmatrix}$

e) $CA = \begin{bmatrix} -1 & 0 \\ 0 & 6 \end{bmatrix}$

f) Sim

2. a) $\begin{bmatrix} 4 & -5 \\ -1 & 0 \\ 0 & 0 \end{bmatrix}_{3\times 2}$

$e_{11} = 2 + 2 = 4$
$e_{12} = -5 + 0 = -5$
$e_{21} = 0 + (-1) = -1$
$e_{22} = 0 + 0 = 0$
$e_{31} = 0$
$e_{32} = 0$

b) $\begin{bmatrix} 0 \\ -4 \end{bmatrix}$ $\quad 2\times 3 \quad 3\times 1$

$e_{11} = 0$
$e_{21} = -3 + (-1) = -4$

c) Impossível $2 \times 3 \quad 3 \neq 1 \quad 1 \times 3$

d) $[2] \quad 1 \times 3 \quad 3 \times 1 \quad a_{11} = 0 + 2 + 0 = 2$

e) $= \begin{bmatrix} 0 & -6 & 2 \\ 0 & 2 & -2 \\ 0 & 0 & 0 \end{bmatrix} \quad 3 \times 3 \quad 1 \times 3$

3. a) $\begin{bmatrix} 9 & 1 \\ 3 & 3 \end{bmatrix}$

b) $\begin{bmatrix} 5 & 1 & -2 \\ 5 & 10 & 5 \\ -7 & -2 & 3 \end{bmatrix}$

c) Impossível $2 \times 2 \neq 3 \times 3$

d) $\begin{bmatrix} 7 & 6 & 5 & 5 & -2 \\ 4 & -8 & 7 & 2 & -1 \\ 0 & 4 & 6 & -3 & 13 \end{bmatrix}$

e) Impossível $4 \times 1 \neq 1 \times 4$

f) $\begin{bmatrix} 9 \\ -2 \\ 3 \\ 8 \end{bmatrix}$

g) $= \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

4. $I\,B = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & -2 \end{bmatrix}_{2\times3}$

$3I\,B = \begin{bmatrix} 0 & 0 & 0 \\ 3 & 0 & -6 \end{bmatrix}_{2\times3}$

$A + 3I\,B = \begin{bmatrix} -2 & 0 & 0 \\ 4 & -1 & -5 \end{bmatrix}_{2\times3}$

$C(A+3IB) = [-6\ 0\ 0]_{1\times3}$

$c_{11} = -6$
$c_{12} = 0+0 = 0$
$c_{13} = 0+0\times(-5) = 0$

$C(A+3IB)D = [-6\ 0\ -6]_{1\times3}$

1×3 3×3
$c_{11} = -6$
$c_{12} = 0$
$c_{13} = -6$

R: $C\times(A+3IB)\times D = [-6\ 0\ 6]$

---

5. A) $A = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$ $|A| = 1\times1 - (-1)\times1 = 2$

B) $B = \begin{bmatrix} 1 & 0 \\ 3 & -1 \end{bmatrix}$ $|B| = 1\times(-1) - 0\cdot3 = -1$

C) $AB = \begin{bmatrix} -2 & 1 \\ 4 & -1 \end{bmatrix}$

$c_{11} = 1+(-3) = -2$
$c_{12} = 0+1 = 1$
$c_{21} = 4$
$c_{22} = -1$

D) $|AB| = -2\cdot-1 - 1\times4 = -2$
E) $|AB| = -2$ $|A|\cdot|B| = 2\times(-1) = -2$ $|AB| = |A|\cdot|B|$
F) $|C| = -1\times-6 - 2\times3 = 0$

G) $D = \begin{bmatrix} 1 & 0 & 2 \\ 0 & -1 & 1 \\ 0 & 0 & 5 \end{bmatrix}$ $|D| = 1\times-1\times5 + 0\times1\times0 + 2\times0\times0 - 2\times-1\times0 - 1\times1\times0 - 0\times0\times5 = -5$

H) A matriz D é uma matriz triangular superior, pois os números à esquerda e abaixo da diagonal principal são nulos

I) $D = \begin{bmatrix} 1 & 0 & 2 \\ 0 & -1 & 1 \\ 0 & 0 & 5 \end{bmatrix}$ $|D| = 1\times-1\times5 = -5$