Ejemplos de productos de matrices

```
ProductoAleatorioMatrices := Module[
  {filas1, fccomunes, columnas2, matriz1, matriz2},
  filas1 = Random[Integer, {2, 4}];
  fccomunes = Random[Integer, {2, 4}];
  columnas2 = Random[Integer, {2, 4}];
  matriz1 = Table[Random[Integer, {1, 10}] - 5, {i, 1, filas1}, {j, 1, fccomunes}];
  matriz2 = Table[Random[Integer, {1, 10}] - 5,  {i, 1, fccomunes}, {j, 1, columnas2}];
  Print[
   MatrixForm[matriz1], "·",
    MatrixForm[matriz2],  "=",
   Simplify[MatrixForm[matriz1 .matriz2]]
  ]
 ]
```

```
For[k = 1, k ≤ 5, k++,
 ProductoAleatorioMatrices]
```

$$\begin{pmatrix} 4 & -1 & 5 & 2 \\ 0 & 5 & 2 & -3 \\ -1 & 2 & 0 & 3 \\ -4 & 4 & 5 & -3 \end{pmatrix} \cdot \begin{pmatrix} 3 & 4 & -2 \\ -4 & 5 & 2 \\ 2 & -4 & 5 \\ 4 & 0 & 5 \end{pmatrix} = \begin{pmatrix} 34 & -9 & 25 \\ -28 & 17 & 5 \\ 1 & 6 & 21 \\ -30 & -16 & 26 \end{pmatrix}$$

$$\begin{pmatrix} -3 & 2 & -3 \\ 1 & 4 & 4 \\ -3 & 0 & 2 \end{pmatrix} \cdot \begin{pmatrix} -4 & 5 \\ 3 & 0 \\ 5 & 5 \end{pmatrix} = \begin{pmatrix} 3 & -30 \\ 28 & 25 \\ 22 & -5 \end{pmatrix}$$

$$\begin{pmatrix} -2 & -4 & 4 \\ -4 & -3 & 4 \end{pmatrix} \cdot \begin{pmatrix} 1 & -1 & 5 & 4 \\ 3 & -2 & 4 & 4 \\ -3 & -3 & 2 & -1 \end{pmatrix} = \begin{pmatrix} -26 & -2 & -18 & -28 \\ -25 & -2 & -24 & -32 \end{pmatrix}$$

$$\begin{pmatrix} 3 & 0 \\ -2 & -4 \\ 1 & -2 \\ -1 & 1 \end{pmatrix} \cdot \begin{pmatrix} -1 & -3 & 1 \\ 5 & 2 & 5 \end{pmatrix} = \begin{pmatrix} -3 & -9 & 3 \\ -18 & -2 & -22 \\ -11 & -7 & -9 \\ 6 & 5 & 4 \end{pmatrix}$$

$$\begin{pmatrix} -2 & -2 & 0 & 2 \\ -2 & -2 & -4 & 1 \\ 0 & -3 & 2 & 2 \\ 4 & 0 & 4 & -2 \end{pmatrix} \cdot \begin{pmatrix} 2 & -3 & -1 \\ 5 & 3 & 2 \\ 0 & 4 & -4 \\ 1 & 1 & 3 \end{pmatrix} = \begin{pmatrix} -12 & 2 & 4 \\ -13 & -15 & 17 \\ -13 & 1 & -8 \\ 6 & 2 & -26 \end{pmatrix}$$

Ejemplos de matrices inversas

```
MatrizInversa[num_] := Module[
  {k, orden, matriz},
  k = 0;
  While[k < num,
   orden = Random[Integer, {2, 3}];
   matriz = Table[Random[Integer, {1, 10}] - 5, {i, 1, orden}, {j, 1, orden}];
   If[ Det[matriz] ≠ 0,
    k++;
    Print["A = ", MatrixForm[matriz],
     ". A^-1 = ", MatrixForm[Inverse[matriz]], "."]]];
 ]
```

```
MatrizInversa[5]
```

$$A = \begin{pmatrix} 5 & -3 & -4 \\ -1 & 0 & 0 \\ 2 & -1 & -1 \end{pmatrix}.\ A^{-1} = \begin{pmatrix} 0 & -1 & 0 \\ 1 & -3 & -4 \\ -1 & 1 & 3 \end{pmatrix}.$$

$$A = \begin{pmatrix} -4 & 2 & -1 \\ 0 & 1 & 2 \\ -3 & 1 & 2 \end{pmatrix}.\ A^{-1} = \begin{pmatrix} 0 & \frac{1}{3} & -\frac{1}{3} \\ \frac{2}{5} & \frac{11}{15} & -\frac{8}{15} \\ -\frac{1}{5} & \frac{2}{15} & \frac{4}{15} \end{pmatrix}.$$

$$A = \begin{pmatrix} 5 & -3 & 2 \\ 4 & 2 & -3 \\ 4 & -3 & 4 \end{pmatrix}.\ A^{-1} = \begin{pmatrix} -\frac{1}{39} & \frac{2}{13} & \frac{5}{39} \\ -\frac{28}{39} & \frac{4}{13} & \frac{23}{39} \\ -\frac{20}{39} & \frac{1}{13} & \frac{22}{39} \end{pmatrix}.$$

$$A = \begin{pmatrix} -3 & -4 & 2 \\ -3 & -1 & 2 \\ -4 & -2 & -2 \end{pmatrix}.\ A^{-1} = \begin{pmatrix} \frac{1}{7} & -\frac{2}{7} & -\frac{1}{7} \\ -\frac{1}{3} & \frac{1}{3} & 0 \\ \frac{1}{21} & \frac{5}{21} & -\frac{3}{14} \end{pmatrix}.$$

$$A = \begin{pmatrix} 5 & -4 \\ 0 & 3 \end{pmatrix}.\ A^{-1} = \begin{pmatrix} \frac{1}{5} & \frac{4}{15} \\ 0 & \frac{1}{3} \end{pmatrix}.$$

Desarrollo de un determinante

```
Subindice[i_, j_] := ToString[i] <> ToString[j];
```

```
Determinante[n_] := Det[Table[a_Subindice[i,j], {i, 1, n}, {j, 1, n}]]
```

```
Expand[Determinante[5]]
```

$$\begin{aligned}
&a_{15} a_{24} a_{33} a_{42} a_{51} - a_{14} a_{25} a_{33} a_{42} a_{51} - a_{15} a_{23} a_{34} a_{42} a_{51} + a_{13} a_{25} a_{34} a_{42} a_{51} + a_{14} a_{23} a_{35} a_{42} a_{51} - \\
&a_{13} a_{24} a_{35} a_{42} a_{51} - a_{15} a_{24} a_{32} a_{43} a_{51} + a_{14} a_{25} a_{32} a_{43} a_{51} + a_{15} a_{22} a_{34} a_{43} a_{51} - a_{12} a_{25} a_{34} a_{43} a_{51} - \\
&a_{14} a_{22} a_{35} a_{43} a_{51} + a_{12} a_{24} a_{35} a_{43} a_{51} + a_{15} a_{23} a_{32} a_{44} a_{51} - a_{13} a_{25} a_{32} a_{44} a_{51} - a_{15} a_{22} a_{33} a_{44} a_{51} + \\
&a_{12} a_{25} a_{33} a_{44} a_{51} + a_{13} a_{22} a_{35} a_{44} a_{51} - a_{12} a_{23} a_{35} a_{44} a_{51} - a_{14} a_{23} a_{32} a_{45} a_{51} + a_{13} a_{24} a_{32} a_{45} a_{51} + \\
&a_{14} a_{22} a_{33} a_{45} a_{51} - a_{12} a_{24} a_{33} a_{45} a_{51} - a_{13} a_{22} a_{34} a_{45} a_{51} + a_{12} a_{23} a_{34} a_{45} a_{51} - a_{15} a_{24} a_{33} a_{41} a_{52} + \\
&a_{14} a_{25} a_{33} a_{41} a_{52} + a_{15} a_{23} a_{34} a_{41} a_{52} - a_{13} a_{25} a_{34} a_{41} a_{52} - a_{14} a_{23} a_{35} a_{41} a_{52} + a_{13} a_{24} a_{35} a_{41} a_{52} + \\
&a_{15} a_{24} a_{31} a_{43} a_{52} - a_{14} a_{25} a_{31} a_{43} a_{52} - a_{15} a_{21} a_{34} a_{43} a_{52} + a_{11} a_{25} a_{34} a_{43} a_{52} + a_{14} a_{21} a_{35} a_{43} a_{52} - \\
&a_{11} a_{24} a_{35} a_{43} a_{52} - a_{15} a_{23} a_{31} a_{44} a_{52} + a_{13} a_{25} a_{31} a_{44} a_{52} + a_{15} a_{21} a_{33} a_{44} a_{52} - a_{11} a_{25} a_{33} a_{44} a_{52} - \\
&a_{13} a_{21} a_{35} a_{44} a_{52} + a_{11} a_{23} a_{35} a_{44} a_{52} + a_{14} a_{23} a_{31} a_{45} a_{52} - a_{13} a_{24} a_{31} a_{45} a_{52} - a_{14} a_{21} a_{33} a_{45} a_{52} + \\
&a_{11} a_{24} a_{33} a_{45} a_{52} + a_{13} a_{21} a_{34} a_{45} a_{52} - a_{11} a_{23} a_{34} a_{45} a_{52} + a_{15} a_{24} a_{32} a_{41} a_{53} - a_{14} a_{25} a_{32} a_{41} a_{53} - \\
&a_{15} a_{22} a_{34} a_{41} a_{53} + a_{12} a_{25} a_{34} a_{41} a_{53} + a_{14} a_{22} a_{35} a_{41} a_{53} - a_{12} a_{24} a_{35} a_{41} a_{53} - a_{15} a_{24} a_{31} a_{42} a_{53} + \\
&a_{14} a_{25} a_{31} a_{42} a_{53} + a_{15} a_{21} a_{34} a_{42} a_{53} - a_{11} a_{25} a_{34} a_{42} a_{53} - a_{14} a_{21} a_{35} a_{42} a_{53} + a_{11} a_{24} a_{35} a_{42} a_{53} + \\
&a_{15} a_{22} a_{31} a_{44} a_{53} - a_{12} a_{25} a_{31} a_{44} a_{53} - a_{15} a_{21} a_{32} a_{44} a_{53} + a_{11} a_{25} a_{32} a_{44} a_{53} + a_{12} a_{21} a_{35} a_{44} a_{53} - \\
&a_{11} a_{22} a_{35} a_{44} a_{53} - a_{14} a_{22} a_{31} a_{45} a_{53} + a_{12} a_{24} a_{31} a_{45} a_{53} + a_{14} a_{21} a_{32} a_{45} a_{53} - a_{11} a_{24} a_{32} a_{45} a_{53} - \\
&a_{12} a_{21} a_{34} a_{45} a_{53} + a_{11} a_{22} a_{34} a_{45} a_{53} - a_{15} a_{23} a_{32} a_{41} a_{54} + a_{13} a_{25} a_{32} a_{41} a_{54} + a_{15} a_{22} a_{33} a_{41} a_{54} - \\
&a_{12} a_{25} a_{33} a_{41} a_{54} - a_{13} a_{22} a_{35} a_{41} a_{54} + a_{12} a_{23} a_{35} a_{41} a_{54} + a_{15} a_{23} a_{31} a_{42} a_{54} - a_{13} a_{25} a_{31} a_{42} a_{54} - \\
&a_{15} a_{21} a_{33} a_{42} a_{54} + a_{11} a_{25} a_{33} a_{42} a_{54} + a_{13} a_{21} a_{35} a_{42} a_{54} - a_{11} a_{23} a_{35} a_{42} a_{54} - a_{15} a_{22} a_{31} a_{43} a_{54} + \\
&a_{12} a_{25} a_{31} a_{43} a_{54} + a_{15} a_{21} a_{32} a_{43} a_{54} - a_{11} a_{25} a_{32} a_{43} a_{54} - a_{12} a_{21} a_{35} a_{43} a_{54} + a_{11} a_{22} a_{35} a_{43} a_{54} + \\
&a_{13} a_{22} a_{31} a_{45} a_{54} - a_{12} a_{23} a_{31} a_{45} a_{54} - a_{13} a_{21} a_{32} a_{45} a_{54} + a_{11} a_{23} a_{32} a_{45} a_{54} + a_{12} a_{21} a_{33} a_{45} a_{54} - \\
&a_{11} a_{22} a_{33} a_{45} a_{54} + a_{14} a_{23} a_{32} a_{41} a_{55} - a_{13} a_{24} a_{32} a_{41} a_{55} - a_{14} a_{22} a_{33} a_{41} a_{55} + a_{12} a_{24} a_{33} a_{41} a_{55} + \\
&a_{13} a_{22} a_{34} a_{41} a_{55} - a_{12} a_{23} a_{34} a_{41} a_{55} - a_{14} a_{23} a_{31} a_{42} a_{55} + a_{13} a_{24} a_{31} a_{42} a_{55} + a_{14} a_{21} a_{33} a_{42} a_{55} - \\
&a_{11} a_{24} a_{33} a_{42} a_{55} - a_{13} a_{21} a_{34} a_{42} a_{55} + a_{11} a_{23} a_{34} a_{42} a_{55} + a_{14} a_{22} a_{31} a_{43} a_{55} - a_{12} a_{24} a_{31} a_{43} a_{55} - \\
&a_{14} a_{21} a_{32} a_{43} a_{55} + a_{11} a_{24} a_{32} a_{43} a_{55} + a_{12} a_{21} a_{34} a_{43} a_{55} - a_{11} a_{22} a_{34} a_{43} a_{55} - a_{13} a_{22} a_{31} a_{44} a_{55} + \\
&a_{12} a_{23} a_{31} a_{44} a_{55} + a_{13} a_{21} a_{32} a_{44} a_{55} - a_{11} a_{23} a_{32} a_{44} a_{55} - a_{12} a_{21} a_{33} a_{44} a_{55} + a_{11} a_{22} a_{33} a_{44} a_{55}
\end{aligned}$$