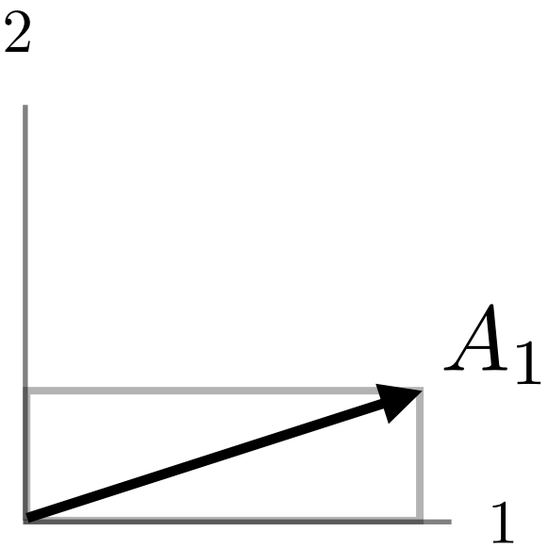
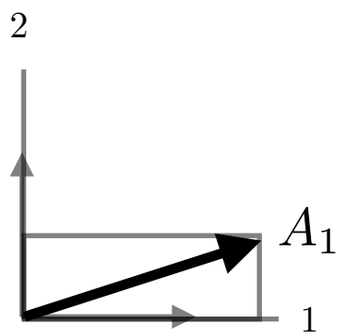
Matrix Multiplication

Column Geometry

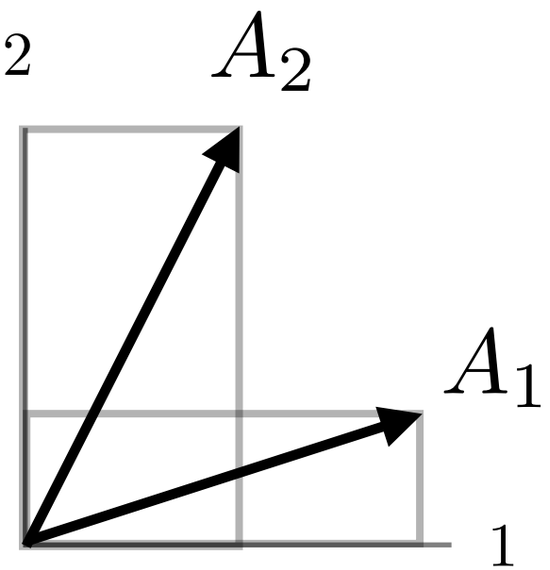
Dan Calderone



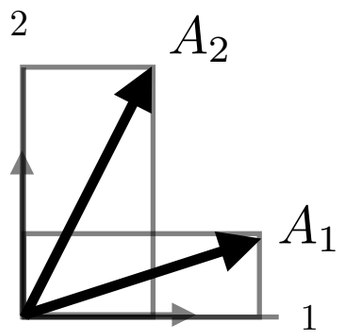
$$\boxed{A} = \left[\begin{array}{c|}\hline A_1 \\ \hline\end{array}\right]$$



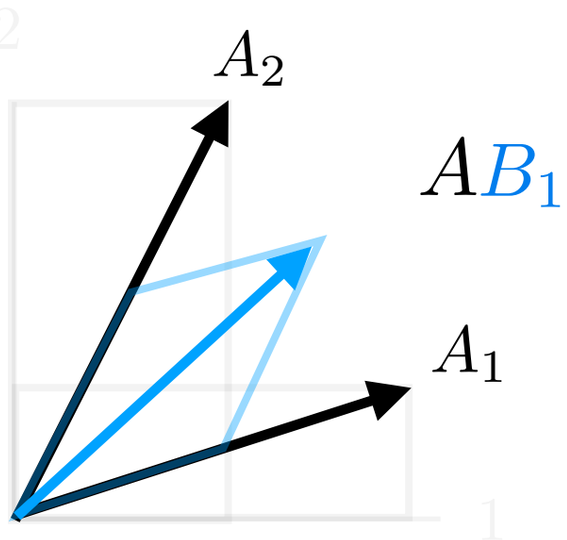
$$A = \left[\begin{array}{c|}\hline A_1 \\ \hline\end{array}\right]$$



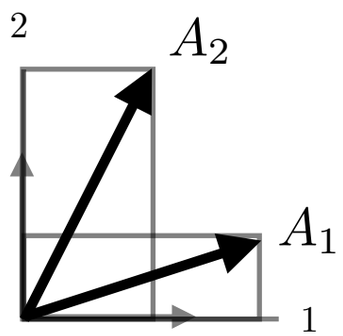
$$\boxed{A} = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix}$$

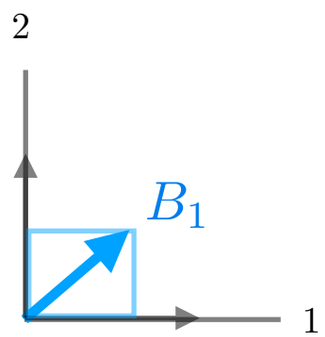


$$A = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix}$$

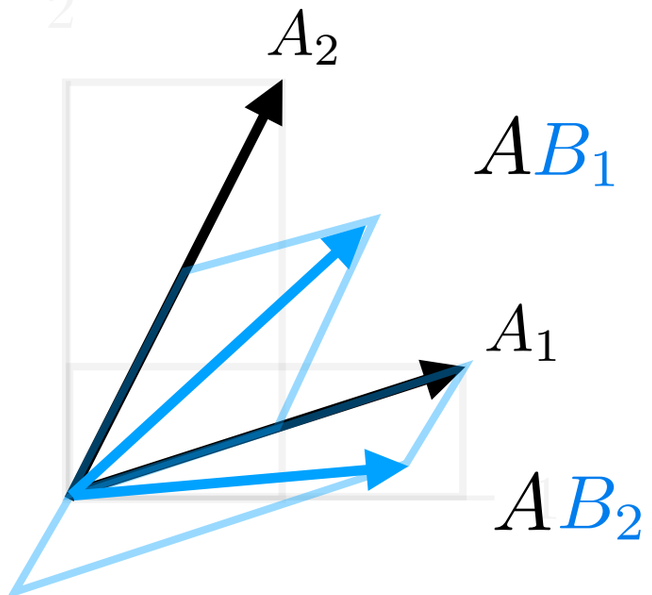


$$\boxed{A}\boxed{B} = \left[\begin{array}{cc|c} | & | & | \\ A_1 & A_2 & B_1 \\ | & | & | \end{array}\right]$$

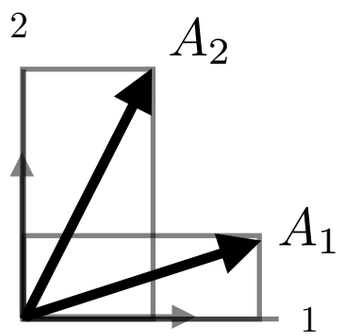


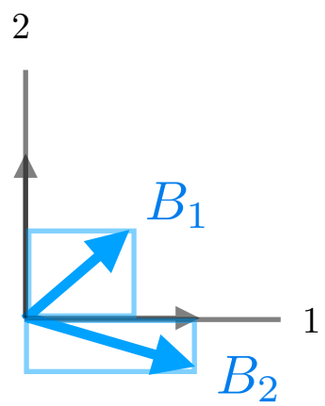


$$A = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix} \qquad B = \begin{bmatrix} | \\ B_1 \\ | \end{bmatrix}$$

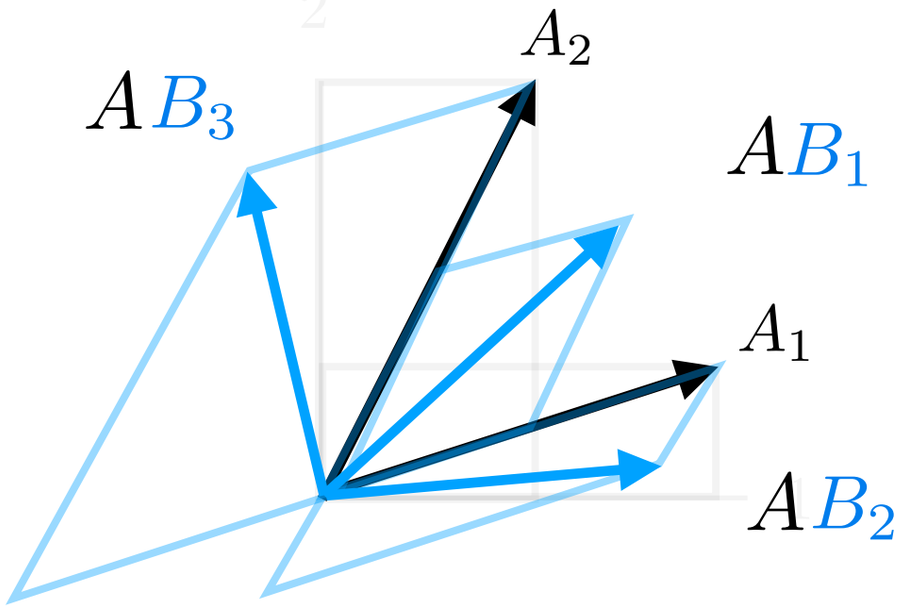


$$\begin{bmatrix} A \end{bmatrix} \begin{bmatrix} B \end{bmatrix} = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix} \begin{bmatrix} | & | \\ B_1 & B_2 \\ | & | \end{bmatrix}$$

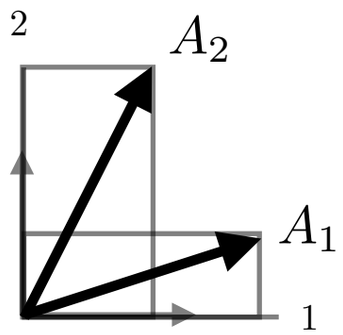


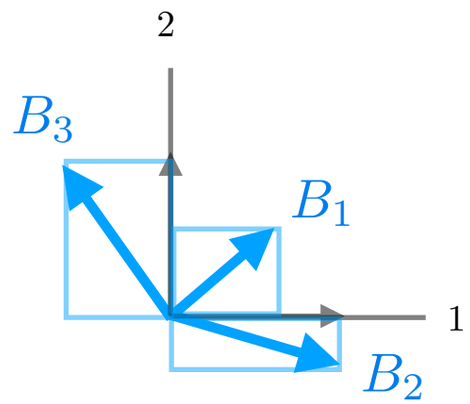


$$A = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix} \qquad B = \begin{bmatrix} | & | \\ B_1 & B_2 \\ | & | \end{bmatrix}$$

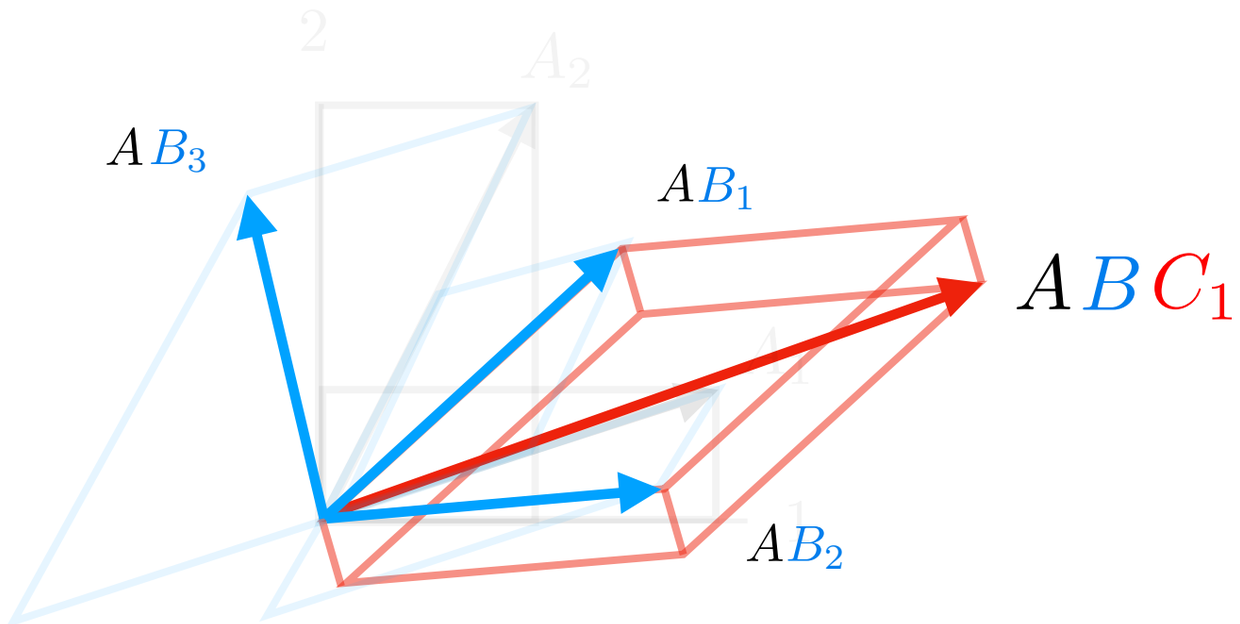


$$\begin{bmatrix} A \end{bmatrix}\begin{bmatrix} B \end{bmatrix} = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix}\begin{bmatrix} | & | & | \\ B_1 & B_2 & B_3 \\ | & | & | \end{bmatrix}$$

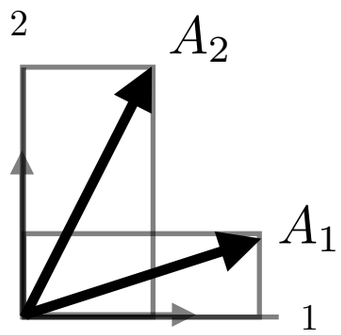


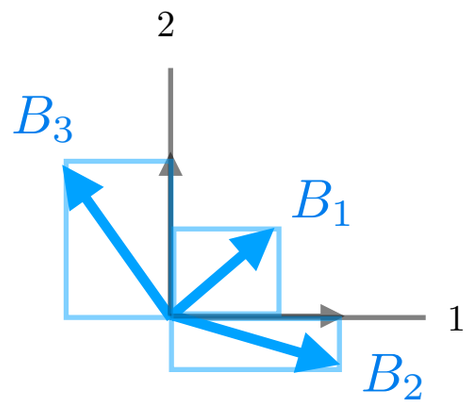


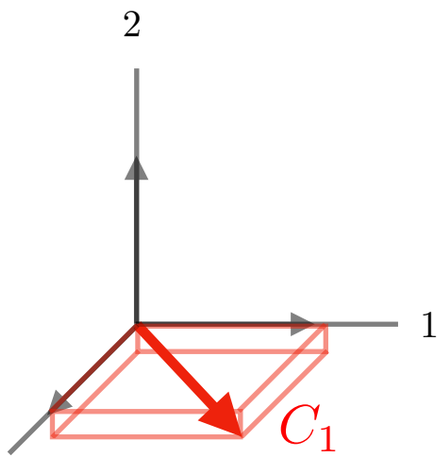
$$A = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix} \qquad B = \begin{bmatrix} | & | & | \\ B_1 & B_2 & B_3 \\ | & | & | \end{bmatrix}$$



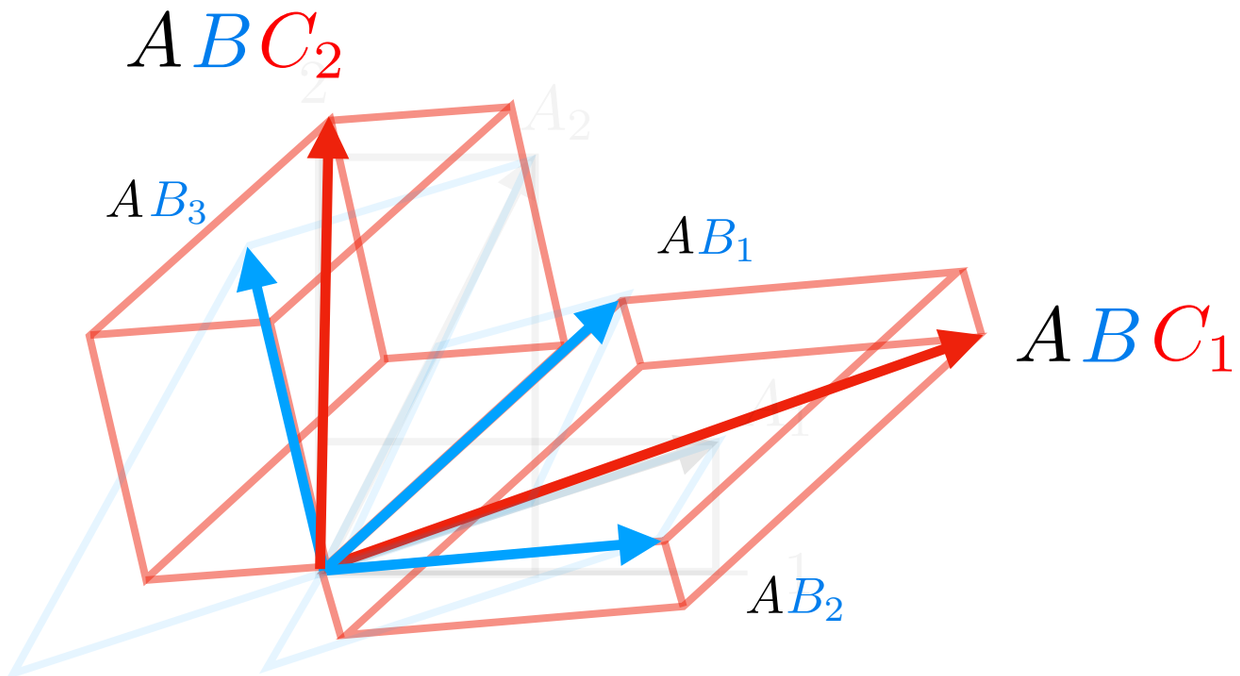
$$\begin{bmatrix} A \end{bmatrix} \begin{bmatrix} B \end{bmatrix} \begin{bmatrix} C \end{bmatrix} = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix} \begin{bmatrix} | & | & | \\ B_1 & B_2 & B_3 \\ | & | & | \end{bmatrix} \begin{bmatrix} | \\ C_1 \\ | \end{bmatrix}$$



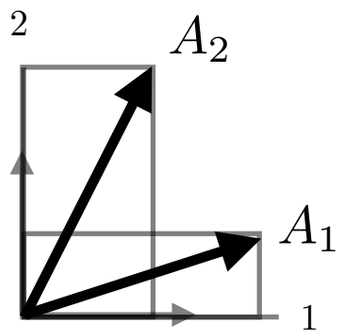


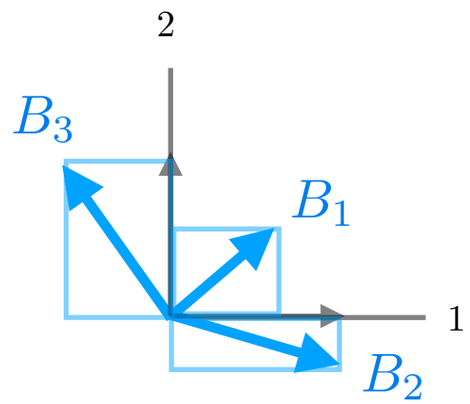


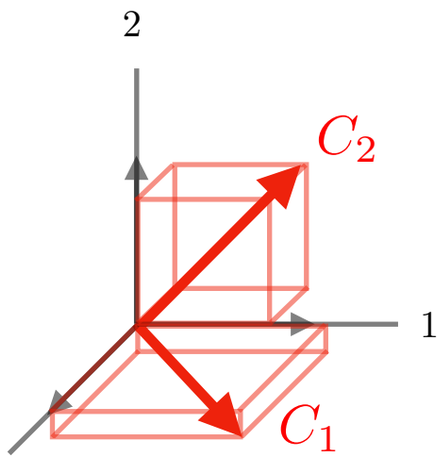
$$A = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix} \qquad B = \begin{bmatrix} | & | & | \\ B_1 & B_2 & B_3 \\ | & | & | \end{bmatrix} \qquad C = \begin{bmatrix} | \\ C_1 \\ | \end{bmatrix}$$



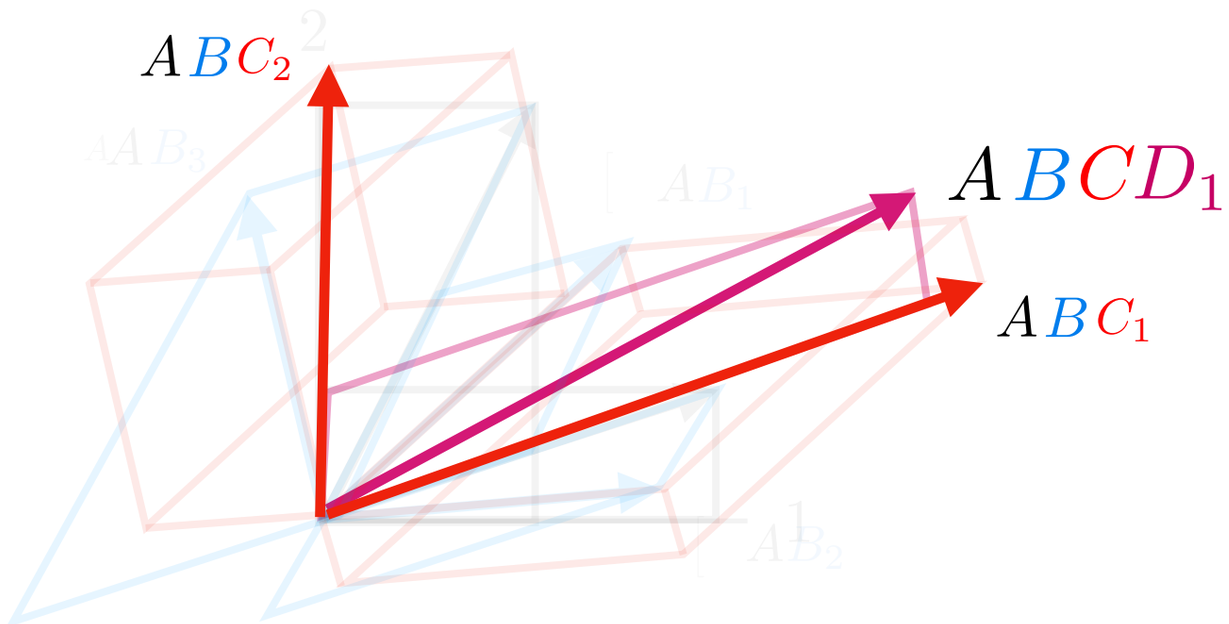
$$\begin{bmatrix} A \end{bmatrix} \begin{bmatrix} B \end{bmatrix} \begin{bmatrix} C \end{bmatrix} = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix} \begin{bmatrix} | & | & | \\ B_1 & B_2 & B_3 \\ | & | & | \end{bmatrix} \begin{bmatrix} | & | \\ C_1 & C_2 \\ | & | \end{bmatrix}$$



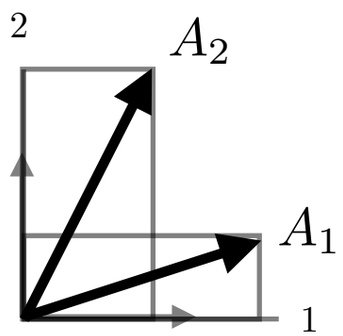


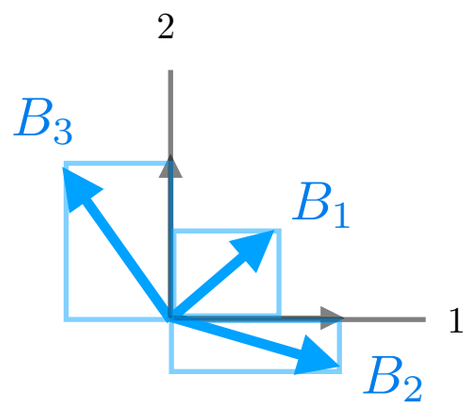


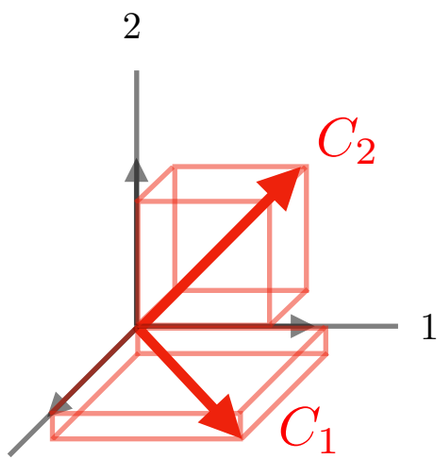
$$A = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix} \qquad B = \begin{bmatrix} | & | & | \\ B_1 & B_2 & B_3 \\ | & | & | \end{bmatrix} \qquad C = \begin{bmatrix} | & | \\ C_1 & C_2 \\ | & | \end{bmatrix}$$

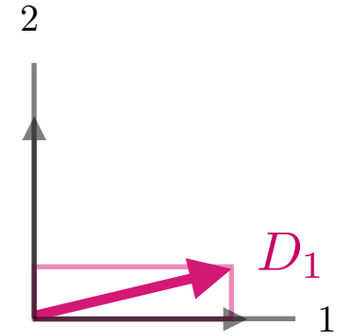


$$[A][B][C][D] = \left[\begin{matrix}|&|\\A_1&A_2\\|&|\end{matrix}\right]\left[\begin{matrix}|&|&|\\B_1&B_2&B_3\\|&|&|\end{matrix}\right]\left[\begin{matrix}|&|\\C_1&C_2\\|&|\end{matrix}\right]\left[\begin{matrix}|\\D_1\\|\end{matrix}\right]$$

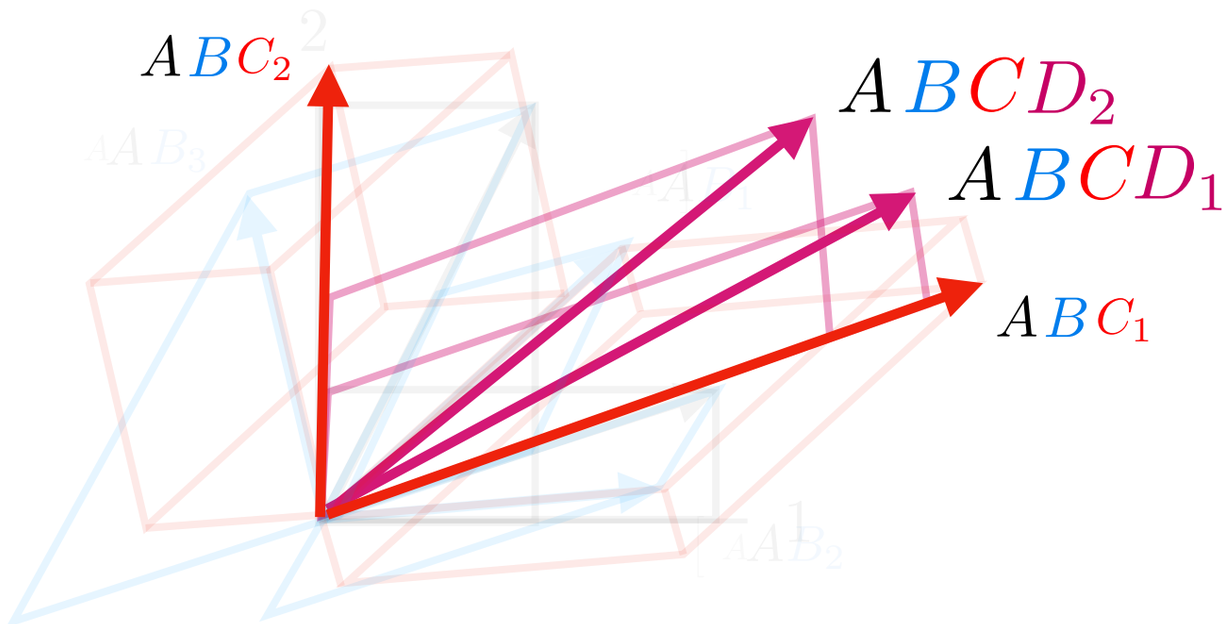




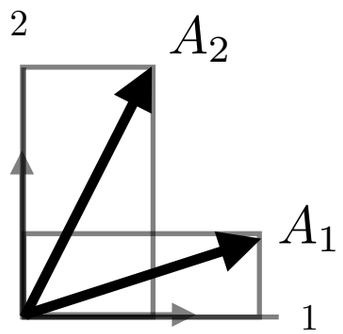


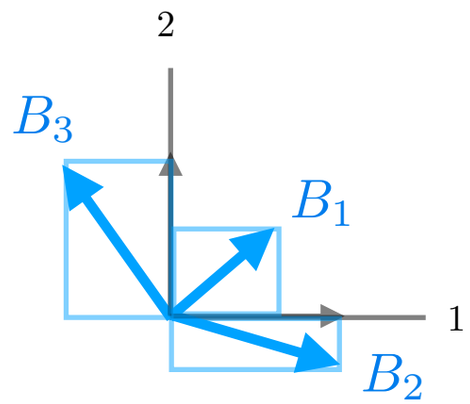


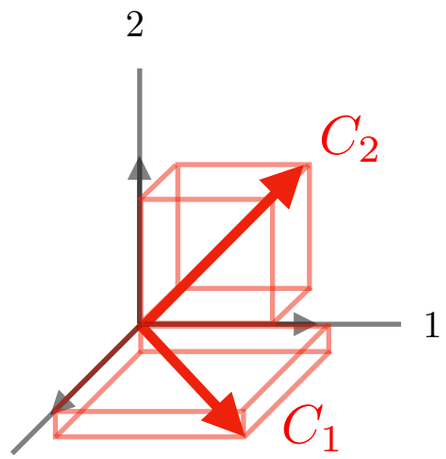
$$A = \left[\begin{matrix}|&|\\A_1&A_2\\|&|\end{matrix}\right] \qquad B = \left[\begin{matrix}|&|&|\\B_1&B_2&B_3\\|&|&|\end{matrix}\right] \qquad C = \left[\begin{matrix}|&|\\C_1&C_2\\|&|\end{matrix}\right] \qquad D = \left[\begin{matrix}|\\D_1\\|\end{matrix}\right]$$

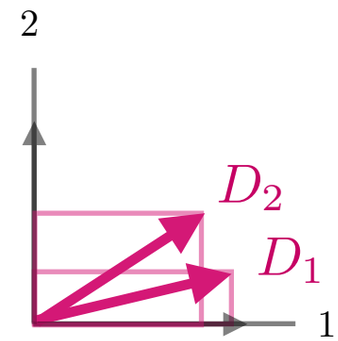


$$\boxed{A}\boxed{B}\boxed{C}\boxed{D} = \left[\begin{array}{cc} | & | \\ A_1 & A_2 \\ | & | \end{array}\right]\left[\begin{array}{ccc} | & | & | \\ B_1 & B_2 & B_3 \\ | & | & | \end{array}\right]\left[\begin{array}{cc} | & | \\ C_1 & C_2 \\ | & | \end{array}\right]\left[\begin{array}{cc} | & | \\ D_1 & D_2 \\ | & | \end{array}\right]$$

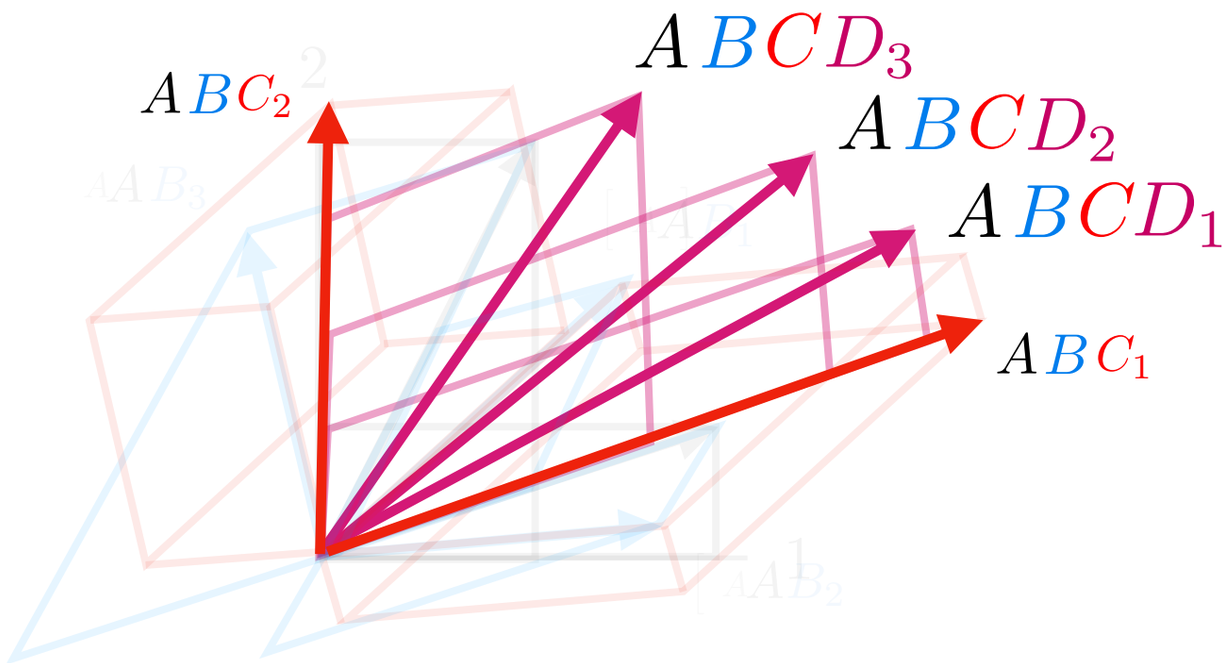




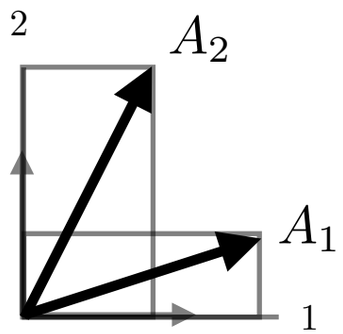


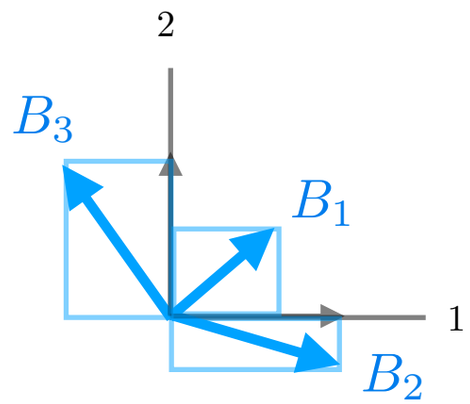


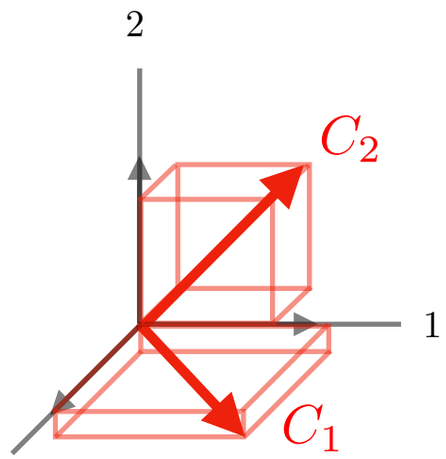
$$A = \left[\begin{array}{cc} | & | \\ A_1 & A_2 \\ | & | \end{array}\right] \qquad B = \left[\begin{array}{ccc} | & | & | \\ B_1 & B_2 & B_3 \\ | & | & | \end{array}\right] \qquad C = \left[\begin{array}{cc} | & | \\ C_1 & C_2 \\ | & | \end{array}\right] \qquad D = \left[\begin{array}{cc} | & | \\ D_1 & D_2 \\ | & | \end{array}\right]$$

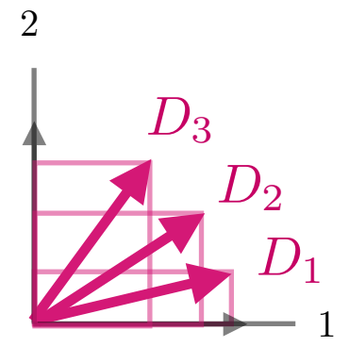


$$\begin{bmatrix} A \end{bmatrix} \begin{bmatrix} B \end{bmatrix} \begin{bmatrix} C \end{bmatrix} \begin{bmatrix} D \end{bmatrix} = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix} \begin{bmatrix} | & | & | \\ B_1 & B_2 & B_3 \\ | & | & | \end{bmatrix} \begin{bmatrix} | & | \\ C_1 & C_2 \\ | & | \end{bmatrix} \begin{bmatrix} | & | & | \\ D_1 & D_2 & D_3 \\ | & | & | \end{bmatrix}$$

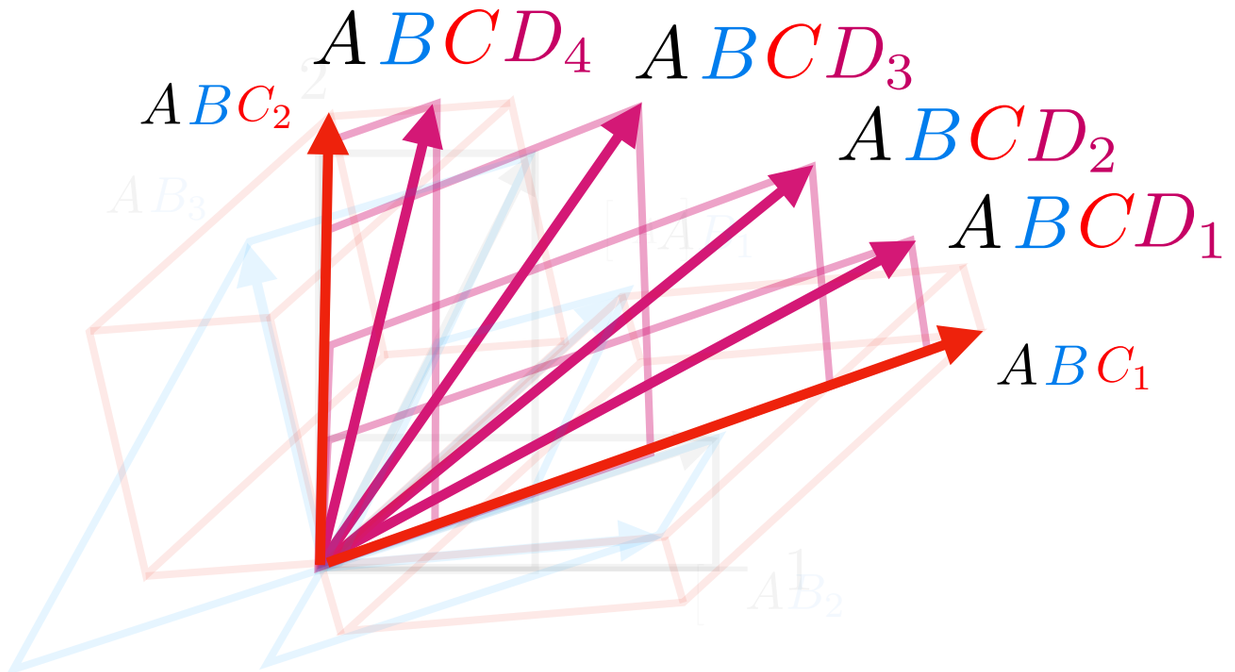




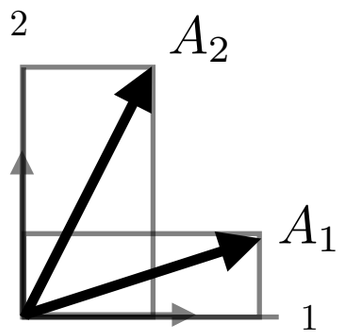


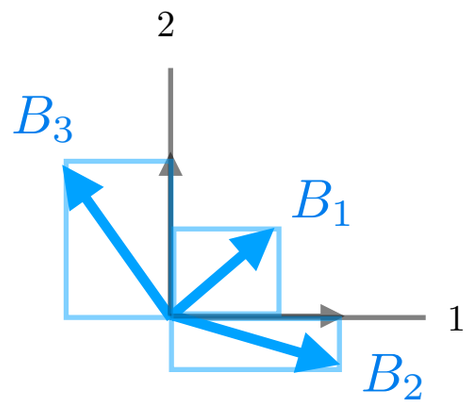


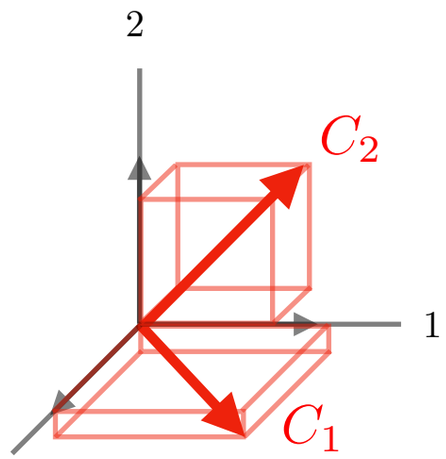
$$A = \begin{bmatrix} | & | \\ A_1 & A_2 \\ | & | \end{bmatrix} \qquad B = \begin{bmatrix} | & | & | \\ B_1 & B_2 & B_3 \\ | & | & | \end{bmatrix} \qquad C = \begin{bmatrix} | & | \\ C_1 & C_2 \\ | & | \end{bmatrix} \qquad D = \begin{bmatrix} | & | & | \\ D_1 & D_2 & D_3 \\ | & | & | \end{bmatrix}$$

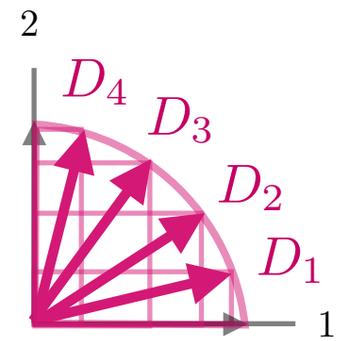


$$\boxed{A}\boxed{B}\boxed{C}\boxed{D} = \left[\begin{array}{cc} | & | \\ A_1 & A_2 \\ | & | \end{array}\right]\left[\begin{array}{ccc} | & | & | \\ B_1 & B_2 & B_3 \\ | & | & | \end{array}\right]\left[\begin{array}{cc} | & | \\ C_1 & C_2 \\ | & | \end{array}\right]\left[\begin{array}{cccc} | & | & | & | \\ D_1 & D_2 & D_3 & D_4 \\ | & | & | & | \end{array}\right]$$









$$A = \left[\begin{array}{cc} | & | \\ A_1 & A_2 \\ | & | \end{array}\right] \qquad B = \left[\begin{array}{ccc} | & | & | \\ B_1 & B_2 & B_3 \\ | & | & | \end{array}\right] \qquad C = \left[\begin{array}{cc} | & | \\ C_1 & C_2 \\ | & | \end{array}\right] \qquad D = \left[\begin{array}{cccc} | & | & | & | \\ D_1 & D_2 & D_3 & D_4 \\ | & | & | & | \end{array}\right]$$