

# Linear algebra

Function `dot` returns the inner product of vectors, matrices, and higher rank tensors. Also known as the matrix product.

Example 1. Compute the product  $AX$  for

$$A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}, \quad X = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

```
A = ((a11,a12),(a21,a22))
X = (x1,x2)
dot(A,X)
```

$$\begin{bmatrix} a_{11}x_1 + a_{12}x_2 \\ a_{21}x_1 + a_{22}x_2 \end{bmatrix}$$

Example 2. Solve for vector  $X$  in  $AX = B$ .

```
A = ((3,7),(1,-9))
B = (16,-22)
X = dot(inv(A),B)
X
```

$$X = \begin{bmatrix} -\frac{5}{17} \\ \frac{41}{17} \end{bmatrix}$$

Example 3. Show that

$$A^{-1} = \frac{\text{adj } A}{\det A}$$

```
A = ((a,b),(c,d))
inv(A) == adj(A) / det(A)
```