Linear algebra

`dot(a,b,...)` returns the inner product of vectors, matrices, and higher rank tensors. Also known as the matrix product. Arguments are evaluated from right to left for optimum efficiency when the last argument is a vector.

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

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

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

1