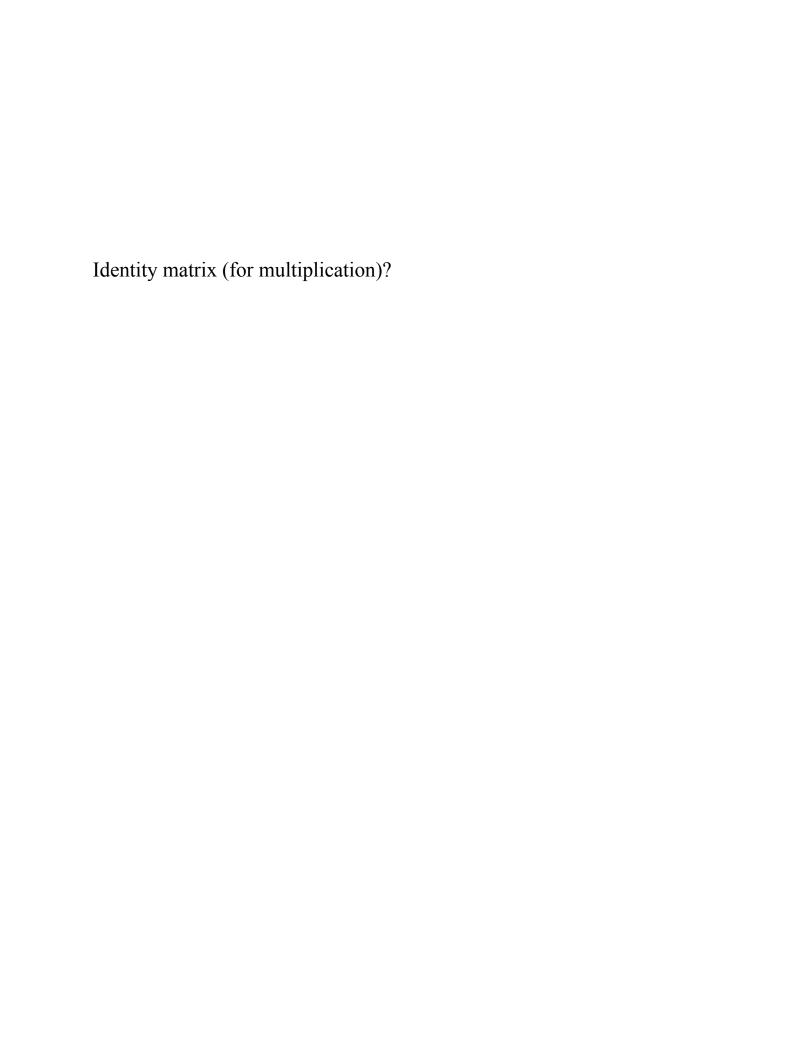
Matrix multiplication
$$\begin{pmatrix} 3 \\ 4 \end{pmatrix}$$
 $\begin{pmatrix} 1 & 2 \end{pmatrix}$

$$\begin{pmatrix} 3 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} 2 & -1 \\ 1 & 2 \end{pmatrix}$$

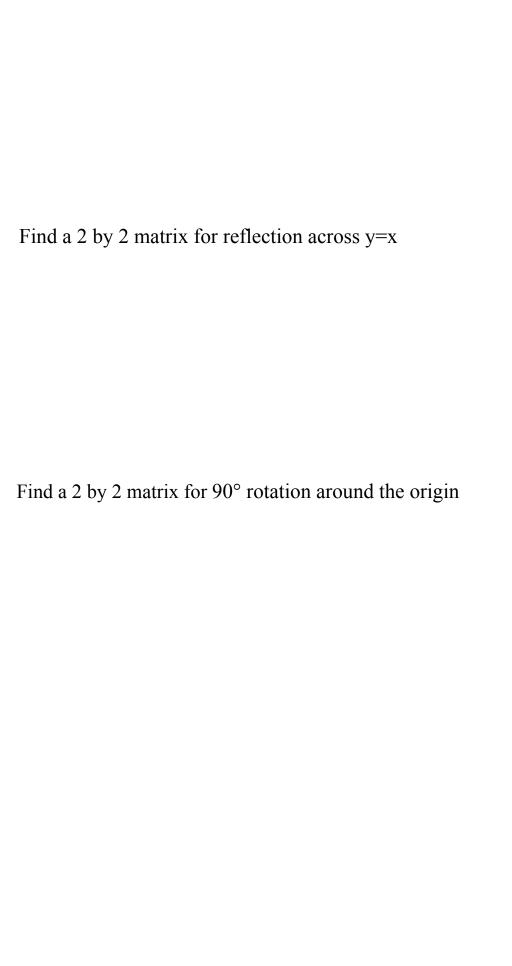
$$\begin{pmatrix} 3 & 3 & 4 \\ 4 & 6 & 6 \end{pmatrix}$$

$$\begin{pmatrix} 2 & -1 \\ 1 & 2 \end{pmatrix}$$



Reflection across x-axis

Reflection across y-axis



Matrix for a rotation around the origin

- 1. start with complex numbers: $(x+iy)(\cos\theta + i\sin\theta)$ 2. find a matrix that will do the same thing 3. check that it works for 90° and 180°

Composition of transformations / Multiplication of matrices Right to left!
Not commutative!

It would be convenient if we could calculate translations using matrix multiplication

We can! $\begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$ pre-image translation $\begin{bmatrix} x+v \\ y+w \\ 1 \end{bmatrix}$ image after translation by vector (v,w)

What would reflection in the x-axis look like as a 3 by 3 matrix?

Create a matrix for a dilation (center at the origin, scaling factor)	k)
crease a manni for a anation (center at the origin, seaming factor))

Use matrix multiplication to rotate (1,2) 33° around (-2,-1)

Matrices in GeoGebra

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