2-4 Modeling Motion w/ matrices

Transformations

Translation - We add $\begin{bmatrix} x & x & x \\ y & y & y \end{bmatrix}$ to the original matrix.

Δ

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} + \begin{bmatrix} 1 & 1 & 1 \\ -2 & -2 & -2 \end{bmatrix} = \begin{bmatrix} 2 & 3 & 4 \\ 2 & 3 & 4 \end{bmatrix}$$

↑ translates the x-coord. 1 unit to the right & the y-coordinate 2 down.

reflect. over y-axis ↓

$$\underset{2\times 2}{\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}} \cdot \underset{2\times 3}{\begin{array}{ccc} A & B & C \\ \begin{bmatrix} 1 & 0 & -2 \\ 2 & 4 & 5 \end{bmatrix} \end{array}}$$

$$\begin{bmatrix} -1\cdot 1+0\cdot 2 & -1\cdot 0+0\cdot 4 & -1\cdot -2+0\cdot 5 \\ 2 & 4 & 5 \end{bmatrix} = \begin{array}{ccc} A' & B' & C' \\ \begin{bmatrix} -1 & 0 & 2 \\ 2 & 4 & 5 \end{bmatrix} \end{array}$$

Composition transformations

hint: $f \circ g$

$f(g(x))$

Ex

A(-6,4)

B(-3,2)

C(-1,2)

Find

$Rot_{90°} \circ R_{y\text{-axis}}$

$$\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix} \cdot \begin{array}{ccc} A & B & C \\ \begin{bmatrix} -6 & -3 & -1 \\ 4 & 2 & 2 \end{bmatrix} \end{array} = \begin{bmatrix} 6 & 3 & 1 \\ 4 & 2 & 2 \end{bmatrix}$$

$$\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \cdot \begin{bmatrix} 6 & 3 & 1 \\ 4 & 2 & 2 \end{bmatrix} = \begin{bmatrix} -4 & -2 & -2 \\ 6 & 3 & 1 \end{bmatrix}$$