PHYS 225 HW 3

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1. a)

$$\begin{bmatrix} 1 & 0 & 4 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} -1 \\ 3 \\ 1 \end{bmatrix} = \begin{bmatrix} -1 \cdot 1 + 3 \cdot 0 + 1 \cdot 4 \\ -1 \cdot 0 + 3 \cdot 1 + 1 \cdot 2 \\ -1 \cdot 0 + 3 \cdot 0 + 1 \cdot 1 \end{bmatrix} = \begin{bmatrix} 3 \\ 5 \\ 1 \end{bmatrix}$$

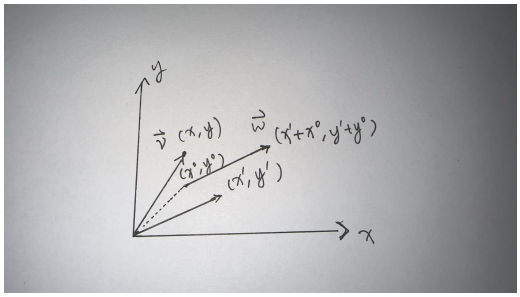
b)

$$\begin{bmatrix} 1 & 0 & a_1 \\ 0 & 1 & a_2 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} b_1 \\ b_2 \\ 1 \end{bmatrix} = \begin{bmatrix} b_1 \cdot 1 + b_2 \cdot 0 + 1 \cdot a_1 \\ b_1 \cdot 0 + b_2 \cdot 1 + 1 \cdot a_2 \\ b_1 \cdot 0 + b_2 \cdot 0 + 1 \cdot 1 \end{bmatrix} = \begin{bmatrix} b_1 + a_1 \\ b_2 + a_2 \\ 1 \end{bmatrix}$$

c)

$$\begin{bmatrix} \cos\theta & -\sin\theta & x^0 \\ \sin\theta & \cos\theta & y^0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} x \\ y \\ 1 \end{bmatrix} = \begin{bmatrix} \cos\theta \cdot x - \sin\theta \cdot y + x^0 \\ \sin\theta \cdot x + \cos\theta \cdot y + y^0 \\ 1 \end{bmatrix}$$

d) It is turing $\overrightarrow{v}$ conter clockwise with degree of θ and shifting its space's origin into (x^0, y^0)



2. a) $M_i^i = 1 - 3 + 5 = 3$

b) $\delta_i^i = n$

c) $M_j^i \delta_i^j = \sum_i^n \sum_j^n M_j^i \delta_i^j = \{\sum_i^n \sum_j^n M_j^i | i = j\} = M_i^i$