-462 Assignment #4 Thomas Bement 24099822

* Assume a 2D element for all following calculations.

$$\underset{\sim}{R} = \begin{bmatrix} c & -s \\ s & c \end{bmatrix}$$

$$\det(\underset{\sim}{R}) = c^2 + s^2 = \boxed{1}$$

$$\underset{\sim}{R} = \begin{bmatrix} c & -s \\ s & c \end{bmatrix} \qquad \underset{\sim}{R}^{-1} = \frac{1}{\det(\underset{\sim}{R})} C(\underset{\sim}{R}) = \frac{1}{1}\begin{bmatrix} c & s \\ -s & c \end{bmatrix} = \underset{\sim}{R}^T$$

$$C(\underset{\sim}{R}) = \begin{bmatrix} c & s \\ -s & c \end{bmatrix} \Rightarrow C(\underset{\sim}{R})^T = \begin{bmatrix} c & -s \\ s & c \end{bmatrix}$$

$$\det(\underset{\sim}{R}^{-1}) = \det(\underset{\sim}{R}^T) = c^2 + s^2 = \boxed{1}$$

$$\underset{\sim}{R} = \begin{bmatrix} c & -s \\ s & c \end{bmatrix} \qquad \underset{\sim}{R}^T = \begin{bmatrix} c & s \\ -s & c \end{bmatrix}$$

$$\underset{\sim}{R}\,\underset{\sim}{R}^T = \begin{bmatrix} c & -s \\ s & c \end{bmatrix}\begin{bmatrix} c & s \\ -s & c \end{bmatrix} = \begin{bmatrix} (c^2+s^2) & (cs-sc) \\ (sc-cs) & (s^2+c^2) \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \underset{\sim}{I} \ (+$$

$$\underset{\sim 45°}{R}^{-1} = \begin{bmatrix} \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \\ -\frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{bmatrix} = \underset{\sim 45°}{R} = \begin{bmatrix} \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \\ -\frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{bmatrix} \Rightarrow (\text{True})$$

$$\underset{\sim 60}{R} = \begin{bmatrix} c_{60} & -s_{60} \\ s_{60} & c_{60} \end{bmatrix} \qquad \underset{\sim -60}{R} = \begin{bmatrix} c_{-60} & -s_{-60} \\ s_{-60} & c_{-60} \end{bmatrix}$$

$$\cos(x) = \cos(-x) \quad -90 \le x \le 90$$

$$\sin(x) = -\sin(-x) \quad -90 \le x \le 90$$

$$\underset{\sim 60}{R}\,\underset{\sim -60}{R} = \begin{bmatrix} c_{60} & -s_{60} \\ s_{60} & c_{60} \end{bmatrix}\begin{bmatrix} c_{60} & s_{60} \\ -s_{60} & c_{60} \end{bmatrix} = \underset{\sim 60}{R}\,\underset{\sim 60}{R}^T = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \underset{\sim}{I} \ (\text{false})$$

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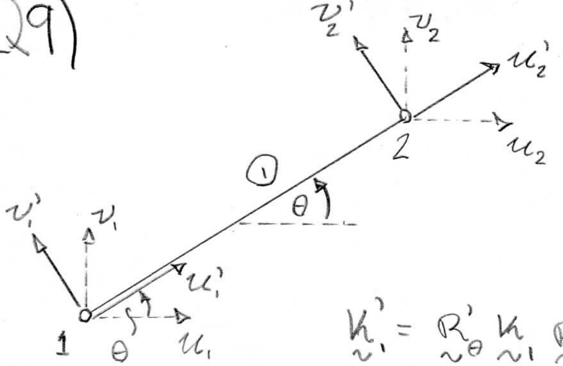
Q9)



$$\underset{\sim}{K}_1' = \begin{array}{c} \\ \\ \\ \\ \end{array}\begin{array}{cccc} u_1' & v_1' & u_2' & v_2' \end{array}$$

$$\underset{\sim}{K}_1' = \left[\begin{array}{cc|cc} 1 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 \\ -1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right]\begin{array}{c} u_1' \\ v_1' \\ u_2' \\ v_2' \end{array}$$

$$\underset{\sim}{K}_1 = \underset{\sim}{R}^T \underset{\sim}{K}_1' \underset{\sim}{R} \quad \& \quad \underset{\sim}{K}_1' = \underset{\sim}{R} \underset{\sim}{K}_1 \underset{\sim}{R}^T \rightarrow (T$$

$$\underset{\sim}{K}_1' = \underset{\sim}{R}_\theta' \underset{\sim}{K}_1 \underset{\sim}{R}_{-\theta} \;, \quad \underset{\sim}{R}_{-\theta} = \underset{\sim}{R}_\theta^T \text{ (from Q8)} \Rightarrow \underset{\sim}{K}_1' = \underset{\sim}{R}_\theta \underset{\sim}{K}_1 \underset{\sim}{R}_\theta^T$$