Theoretical Mechanics, Quiz 1: PART LIN

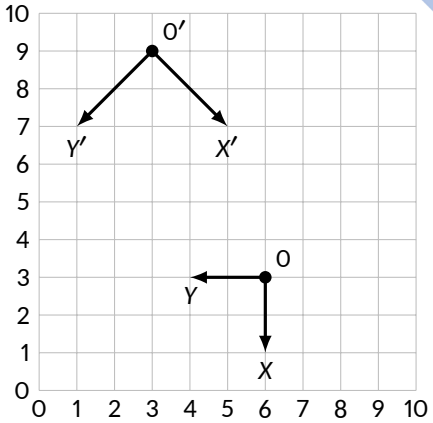
Particle kinematics

Linear Algebra

Innopolis University

Quiz 1

1. Write down a velocity equation, using natural form. Show up the dimensions of each element of the formulae. Explain what each element means and their properties, if exists.
2. Find a transformation matrix from XOY to $X'O'Y'$ (length of vectors is important).



Quiz 1, Task 2

Answer

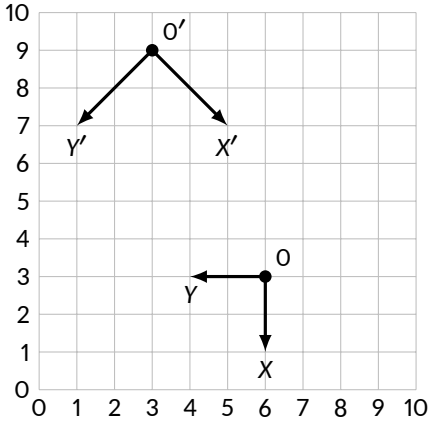
Task 2

$$T = \begin{bmatrix} 1 & 0 & -3 \\ 0 & 1 & 1.5 \\ 0 & 0 & 1 \end{bmatrix}$$

$$R_z = \begin{bmatrix} \cos(45) & \sin(45) & 0 \\ -\sin(45) & \cos(45) & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 0 \\ -\frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$Sc = \begin{bmatrix} \sqrt{2} & 0 & 0 \\ 0 & \sqrt{2} & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$H = TR_zSc = \begin{bmatrix} 1 & 1 & -3 \\ -1 & 1 & 1.5 \\ 0 & 0 & 1 \end{bmatrix} \quad \text{Check} - H \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} -2 \\ 0.5 \\ 1 \end{bmatrix}$$



Quiz 1, Task 2