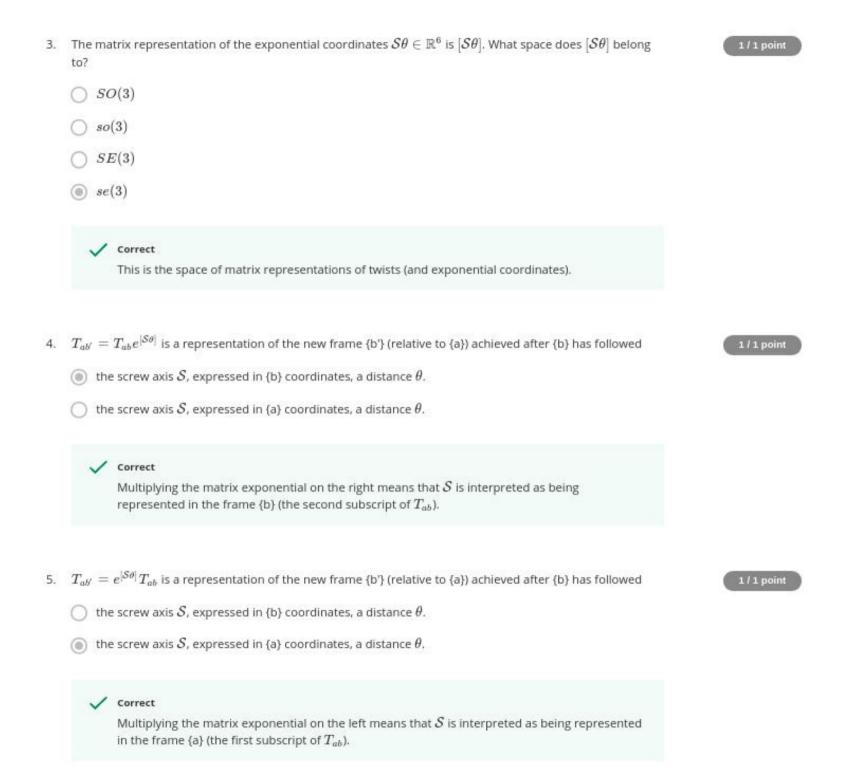
Lecture Comprehension, Exponential Coordinates of Rigid-Body Motion (Chapter 3.3.3)

TOTAL BOINTS 6

Although we use six numbers to represent a screw $\mathcal{S}=(\mathcal{S}_{\omega},\mathcal{S}_{v})$, the space of all screws is only 5-dimensional. Why? $\mathcal{S}_{\omega} \text{ must be unit length.}$	1/1 point
\mathcal{S}_v must be unit length. (a) Either \mathcal{S}_ω or \mathcal{S}_v must be unit length.	
\checkmark Correct If both the angular and linear components of the screw are nonzero, then the screw is defined so that $\ \mathcal{S}_{\omega}\ =1$.	
A transformation matrix T_{ab} , representing {b} relative to {a}, can be represented using the 6-vector exponential coordinates $S\theta$, where S is a screw axis (represented in {a} coordinates) and θ is the distance followed along the screw axis that displaces {a} to {b}. Which of the following is correct? Select all that apply.	0 / 1 point
\checkmark Correct $ heta$ is just a scalar, so $[\mathcal{S}] heta=[\mathcal{S} heta].$	
$egin{aligned} & T_{ab} = e^{[\mathcal{S} heta]} \ & & & & & & & & & & & & & & & & & & $	
	For example of the screw are nonzero, then the screw is defined so that $\ \mathcal{S}_{\omega}\ = 1$. A transformation matrix T_{ab} , representing {b} relative to {a}, can be represented using the 6-vector exponential coordinates $\mathcal{S}\theta$, where \mathcal{S} is a screw axis (represented in {a} coordinates) and θ is the distance followed along the screw axis that displaces {a} to {b}. Which of the following is correct? Select all that apply. $T_{ab} = e^{\mathcal{S}\theta}$ $T_{ab} = e^{ \mathcal{S}\theta }$ Correct θ is just a scalar, so $[\mathcal{S}]\theta = [\mathcal{S}\theta]$.

You didn't select all the correct answers



- Which of the following statements is true? Select all that apply.
 - The matrix exponential maps $[S\theta] \in se(3)$ to a transformation matrix $T \in SE(3)$, where T is the representation of the frame (relative to $\{s\}$) that is achieved by following the screw S (expressed in $\{s\}$) a distance θ from the identity configuration (i.e., a frame initially coincident with $\{s\}$).

Correct

The matrix exponential maps $[\mathcal{V}] \in se(3)$ to a transformation matrix $T \in SE(3)$, where T is the representation of the frame (relative to $\{s\}$) that is achieved by following the twist \mathcal{V} (expressed in $\{s\}$) for unit time from the identity configuration (i.e., a frame initially coincident with $\{s\}$).

✓ Correct

If we choose $\mathcal{V}=\mathcal{S}\theta$, then following the twist \mathcal{V} for unit time is equivalent to following the screw axis \mathcal{S} a distance θ .

- The matrix log maps an element of se(3) to an element of SE(3).
- The matrix log maps an element of SE(3) to an element of se(3).

✓ Correct

There is a one-to-one mapping between twists and elements of se(3).

