✔ **Congratulations! You passed!**

Grade received 100%   To pass 80% or higher

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1. Our representation of the three-dimensional orientation uses an implicit representation (a 3x3 SO(3) matrix with 9 numbers), but our usual representation of the angular velocity uses only three numbers, i.e., an explicit parametrization of the three-dimensional velocity space. Why do we use an implicit representation of the orientation but an explicit parametrization of the angular velocity?

    ○ There is no natural implicit representation of an angular velocity.

    ◉ The space of angular velocities can be equated to a "flat" 3d space (a linear vector space) tangent to the curved 3d surface of orientations at any given time, so it can be globally represented by 3 numbers without singularities. The space of orientations, on the other hand, is not flat, and cannot be globally represented by 3 numbers without a singularity.

    ✔ **Correct**

    1 / 1 point

2. A rotation matrix is an element of which space?

    ○ $\mathbb{R}^3$

    ◉ $SO(3)$

    ○ $so(3)$

    ✔ **Correct**

    1 / 1 point

3. An angular velocity is an element of which space?

    ◉ $\mathbb{R}^3$

    ○ $SO(3)$

    ○ $so(3)$

    ✔ **Correct**

    1 / 1 point

4. The 3x3 skew-symmetric matrix representation of an angular velocity is an element of which space?

    ○ $\mathbb{R}^3$

    ○ $SO(3)$

    ◉ $so(3)$

    ✔ **Correct**

    1 / 1 point

5. If an angular velocity is represented as ω_b in the body frame {b}, what is the representation of the same angular velocity in the space frame {s}?

    ◉ $R_{sb}\omega_b$

    ○ $R_{bs}\omega_b$

    ○ $\omega_b R_{sb}$

    ○ $\omega_b R_{bs}$

    ✔ **Correct**
    This is correct by the subscript cancellation rule.

    1 / 1 point

6. The cross-product $\omega \times p$ can be written $[\omega]p$, where $[\omega]$ is

    ○ the $SO(3)$ representation of ω.

    ◉ the skew-symmetric $so(3)$ representation of ω.

    ✔ **Correct**
    The 3x3 skew-symmetric matrix representation of a 3-vector allows calculating a cross product using matrix multiplication.

    1 / 1 point