Congratulations! You passed!

Grade received 100% To pass 80% or higher

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1. A 4x4 transformation matrix (element of $SE(3)$) consists of a rotation matrix, a 3-vector, and a row consisting of three zeros and a one. What is the purpose of the row of 4 constants? **1 / 1 point**

- ○ This row is a historical artifact.
- ◉ This row allows simple matrix operations for useful calculations.

Correct

2. Which of the following are possible uses of a transformation matrix? Select all that apply. **1 / 1 point**

- ☑ Displace (rotate and translate) a frame.

Correct

- ☑ Displace a vector.

Correct

- ☑ Change the frame of reference of a vector.

Correct

- ☑ Represent the position and orientation of one frame relative to another.

Correct

3. The representation of a point p in the {b} frame is $p_b \in \mathbb{R}^3$. To find the representation of this point in the {a} frame, we could write $T_{ab}p_b$, but there is a dimension mismatch; p_b has only 3 components, but T_{ab} is 4x4. How do we alter p_b to allow this matrix operation? **1 / 1 point**

- ◉ Put a 1 in the last row of p_b, making it a 4-element column vector, and otherwise ignore the last row in your interpretation of the 4-vector.
- ○ Put a 0 in the last row of p_b, making it a 4-element column vector, and otherwise ignore the last row in your interpretation of the 4-vector.

Correct

4. Which of these is a valid calculation of T_{ab}, the configuration of the frame {b} relative to {a}? Select all that apply. **1 / 1 point**

- ☑ $T_{ac}T_{cb}$

Correct
Correct by subscript cancellation rule.

- ☐ $T_{cb}T_{ac}$
- ☑ $T_{ac}T_{dc}^{-1}T_{db}$

Correct
T_{dc}^{-1} is equivalent to T_{cd}, so this is correct by the subscript cancellation rule.

- ☑ $(T_{bc}T_{ca})^{-1}$

Correct
Assuming the matrices A and B are invertible, then the following identity holds: $(AB)^{-1} = B^{-1}A^{-1}$. Then the expression is correct from our subscript cancellation rule.