Congratulations! You passed!

Grade received 100% To pass 80% or higher

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1. Consider a robot with 8 joints. What is the dimension of its space Jacobian matrix? 1 / 1 point

- ○ 8x6.
- ◉ 6x8.

Correct
The space Jacobian premultiplies the 8-vector of joint velocities, giving the 6-vector spatial twist.

2. Consider a robot with 4 joints. What is the maximum rank of its space Jacobian? 1 / 1 point

- ◉ 4
- ○ 6

Correct
The Jacobian is 6x4, and the maximum rank of a matrix is the smaller of its two dimensions.

3. At a particular configuration, the rank of a robot's space Jacobian is 5. Is the robot at a singular configuration? 1 / 1 point

- ○ Yes, since the rank is less than 6, which is the dimension of a spatial twist.
- ◉ There is no way to know from the information given.

Correct
The definition of a singular configuration is that the rank of the robot's Jacobian drops from its maximum value. If the robot has only 5 joints, the maximum rank of the Jacobian can be no more than 5. Therefore, a 5-joint robot cannot be at a singularity when the rank of its space Jacobian is 5. On the other hand, if the robot has 6 or more joints and the rank of the Jacobian is 6 at certain configurations, then the robot must be at a singularity.

4. If joint i is moving at a joint velocity v and all other joint velocities are zero, what is the spatial twist describing the end-effector's motion? 1 / 1 point

- ◉ v times the i'th column of the space Jacobian.
- ○ v times the i'th row of the space Jacobian.
- ○ Neither of the above.

Correct

5. The space Jacobian 1 / 1 point

- ◉ does not depend on the end-effector frame {b}.
- ○ does not depend on the space frame {s}.

Correct

6. Which column of the space Jacobian does not depend on the joint configuration θ? 1 / 1 point

- ◉ The first column.
- ○ The last column.
- ○ All columns depend on θ.

Correct