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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?

0 / 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.

✘ Incorrect

The definition of a singular configuration is that the rank of the robot's Jacobian drops from its maximum value, not that the rank is less than 6.

4. If joint  $i$  is moving at a joint velocity  $\dot{v}$  and all other joint velocities are zero, what is the spatial twist describing the end-effector's motion?

1 / 1 point

- ☒  $\dot{v}$  times the  $i$ 'th column of the space Jacobian.  
☐  $\dot{v}$  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  $\theta$ ?

1 / 1 point

- ☒ The first column.  
☐ The last column.  
☐ All columns depend on  $\theta$ .

✔ Correct