

# Lab 4 Questions

Robotics & Automation  
Dylan Losey, Virginia Tech

**Instructions.** Print your name at the top of the page. Turn in this sheet at the end of lab: your lab grade will be based on your answers.

**Question 1.** Write each column of the space Jacobian.

$$J_{s1} =$$

$$J_{s2} =$$

$$J_{s3} =$$

**Question 2.** Write each column of the geometric Jacobian.

$$J_1 =$$

$$J_2 =$$

$$J_3 =$$

**Question 3.**

**Question 4.**

linear velocity	joints contributing	does the answer depend on $\theta$ ?
$\dot{p}_x$		
$\dot{p}_y$		
$\dot{p}_z$		

**Question 5.**

*Signed by lab GTA:* \_\_\_\_\_

**Question 6.** You can use the back of this page if you need extra space.