

These questions relate to lecture material and aim to highlight the most important concepts. We will cover questions similar to these for our final.

1. Consider the simple vehicle model from class. At a high level, how are forces and torques used to control the position and orientation?
2. Suppose our vehicle moves in the XZ plane. Given a desired velocity of $(1,0,3)$, compute the desired heading and desired speed for the vehicle.
3. Given the desired heading and speed from Q2, how do we compute control forces and torques for it? Give the equations and mark what each variable means.
4. What is the local state for the vehicle? What is its derivative? How do we update the state of the vehicle using Euler's Method?
5. Suppose the current local state of the vehicle is a heading of 10 degrees and speed of 3 units/second. What is the (x,y,z) velocity?
6. Given the velocity from Q5, suppose the vehicle is at position $(-1,0,-5)$. What is the position at the next time step if the delta time is 0.1s?