**Chemical Engineering 374**

**Reading Questions 5—Chapter 4.1, 4.5**

**Name** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. If the flow rate of a liquid through a nozzle (which changes with diameter) does not change with time, is it considered steady flow…
   1. From the Eulerian point of view? Why?
   2. From the Lagrangian point of view? Why?
2. The material derivative is . Which term on the right-hand side of the equals sign represents the change in the Eulerian frame, and which accounts for Lagrangian motion through the Eulerian frame?
3. With respect to the Reynolds transport theorem, how does the system differ from the control volume? Is the conservation law usually written for a system or a control volume (think: “mass is conserved,” or “F=ma”).
4. In the Reynolds transport theorem, if the control volume is fixed (rigid and immovable), what modification does that allow in the first term on the right side of the equals sign? Why?
5. In the Reynolds transport theorem, if it is allowable to express the inlet and outlet flows in terms of known average flow rates and properties (instead of detailed functions of position), what modification does that allow in the second term on the right side of the equals sign? Why?