**Chemical Engineering 374**

**Reading Questions 13—Chapter 8.1-8.4**

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

1. In turbulent flow, why is the shear stress much larger than –dvavg/dr?
2. With respect to pipe flows, when is a surface considered rough and when is it considered smooth?
3. Is the Colebrook equation theoretical or emperical? Explain.
4. Indicate two places in the textbook where roughness values are given for various kinds of pipe. What might cause the actual roughness values to be larger than the values given in the book?
5. Regarding Example 8-3, comment on which of the following would have increased the pumping power the most: smooth pipe, cast iron pipe, commercial steel pipe, or copper tubing. Why?