1. For TCP, the lecture notes (slide 89) make the following statement: "receivers CAN buffer out of sequence packets".

   (a) Why might a receiver choose not to do this?
   (b) Does a sender need to know whether a receiver buffers out of sequence packets? Why? Why not?

2. Derive the TCP throughput equation on slide 185. Why is it important for TCP to measure the round trip time?

3. It is interesting to consider the consequences if TCP’s behaviour was a bit different. Describe the consequences if the following were true:

   (a) TCP slow-start increased CWND by 1 for each ack
   (b) TCP does not reset the CWND to 1 after a timeout
   (c) TCP resets CWND to 1 after a duplicate ACK
   (d) TCP uses MIMD (i.e., CWND doubles every RTT) instead of AIMD

4. TCP has a few problems areas (slide 189)

   (a) Why are non-congestion losses bad for TCP? Give examples of how non-congestion losses might arise.
   (b) TCP has a tendency to fill up buffers. What problem do backed up queues present?
   (c) Give two reasons why short flows are inefficient for TCP. What kind of Internet activity can result in many short flows?