Name: _____

This week's readings

[1] Van Jacobson and Michael J. Karels. Congestion avoidance and control. *ACM Computer Communication Review*, 18(4):314–329, November 1988. URL http://www-nrg.ee.lbl.gov/papers/congavoid.pdf.

[2] Lawrence Brakmo and Larry Peterson. TCP Vegas: End to end congestion avoidance on a global Internet. *IEEE Journal on Selected Areas in Communication*, 13(8):1465–1480, October 1995. URL ftp://ftp.cs.arizona.edu/xkernel/Papers/jsac.ps.Z.

[3] Arun Venkataramani, Ravi Kokku, and Mike Dahlin. TCP Nice: A mechanism for background transfers. In *Symposium on Operating Systems Design and Implementation (OSDI)*. December 2002. URL http://www.usenix.org/events/osdi02/tech/full_papers/venkataramani/venkataramani.pdf.

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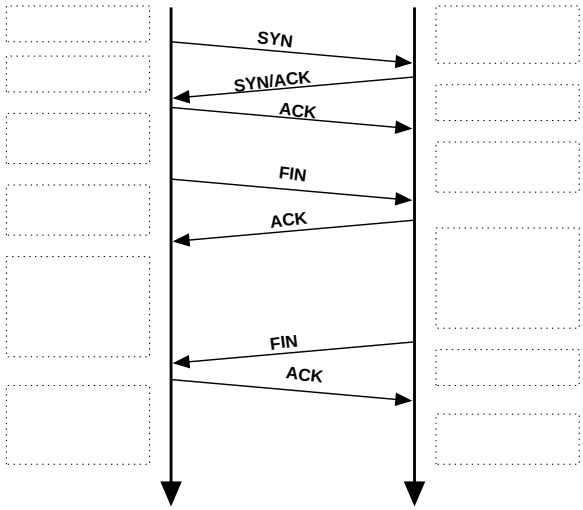
1. What does "packet conservation" mean (in your own words)? Why is it good?

2. Name two differences between "slow start" and "congestion avoidance."

3. Routers in the Internet often have large queues – queues large enough to prevent loss. (a) If TCP Reno sees no loss, what happens? (b) If TCP Vegas sees no loss, what happens?

4. In 1982, Dave clark noticed that as many acks as packets were being sent by TCP receivers, and introduced a "delayed ack" rule in RFC 813, described more clearly in RFC 1122. Briefly, this rule means that a receiver should send an ack for every two in-order segments. (Out-of-order segments suggest packet loss, so acks are immediate when so important.) If a second packet is not received in 200ms, the "delayed ack timer" fires, and an acknowledgement is generated anyway. How might this interact badly with the congestion control algorithms described my Jacobson and Karels? (Note that 200ms is not sufficient to "disturb the round-trip timing and packet 'clocking' algorithms as warned in RFC 1122.")

5. Annotate each side of the TCP connection below with its state at each point in the connection. Assume all packets are in order and none are lost. Fill in each dotted box. If you do not have a textbook with a proper TCP state machine, RFC 793 has an ASCII-art version. (If composing your answers electronically, list "left side top-to-bottom" then "right side top-to-bottom").



6. For Wednesday, review TCP Nice (paper #3). A review should consist of:
   (a) A (at most two-paragraph) summary of the paper
   (b) Three major strengths: what might get this paper accepted?
   (c) Three major weaknesses: what might get this paper rejected?
   (d) Contributions: why is this paper valuable? why might it be cited by others?
   (e) Unresolved questions: missing methodology, missing evaluation, unclear presentation. We may review some of these questions in class.

   A page is sufficient, two pages probably too long. Email it to me with a subject of "711 review 1" BEFORE NOON so that I have a chance to skim before lecture.