Problem Set 1 (due September 22, 2003). [50 points]

1. (20 points): Write a program that opens a UPD socket and allows two users to communicate by sending messages on some port `port_number` (e.g., 1234). For examples of client and server socket programs you can refer to the following:
   - http://www.ccs.neu.edu/home/noubir/Courses/CSG150/F03/Samples/sockets/client-tcp.c
   - http://www.ccs.neu.edu/home/noubir/Courses/CSG150/F03/Samples/sockets/server-tcp.c
   - http://www.ccs.neu.edu/home/noubir/Courses/CSG150/F03/Samples/sockets/client-udp.c
   - http://www.ccs.neu.edu/home/noubir/Courses/CSG150/F03/Samples/sockets/server-udp.c

   If needed you can also get more information from various internetworking books such as: “Computer Networks”, Peterson & Davie, Morgan Kaufmann Publishers.

   sunstation1> chat sunstation2 1234
   Hello
   How are you?

   sunstation2> chat sunstation1 1234
   Hello
   How are you?

2. (10 points) describe the steps that your web browser goes through when accessing an html page such as: www.ccs.neu.edu. Assume that your computer is connected to a LAN (Ethernet). You can gather such information from the web and general networking books.

   Hint: Involved elements are TCP port #, DNS, html, ARP, Ethernet.

3. (20 points): Assume that a transmitter and a receiver are communicating over a channel such that the signal to noise ratio ($S/N_0 W$) is equal to 40dB. Assume that the channel bandwidth is 1 MHz.

   a. What is the maximum data rate that can be achieved with this communication?

   b. Assume that the transmitter only needs to send (one-way) a packet of 1Kbytes every 1 millisecond. How much energy would the sender save by reducing its signal power and satisfying its packet transmission requirement?