Problem 1: Late one night in the computer lab, you had an epiphany: You could build a pizza-ordering system for the lab! Students could use an app to send requests for individual slices of pizza to a server. The server would accumulate orders until it had enough slices to make up a pizza, then order one to be delivered to the lab. Users should be allowed to order as many slices as they want. No payment information needs to be exchanged — the server will keep a “tab” for each student and you can manually handle billing at the end of the month. (To avoid abuse, the server would double-check user names against the enrollment database to ensure that only Puget Sound students were allowed to order pizza.)

First you’ll need to design a protocol for use between the pizza-ordering apps and the server. Let’s call it the Pizza Purchasing Protocol (PPP).

1a) [14 Points]: Describe the message types that PPP will support and explain why each is necessary.

1b) [14 Points]: Describe your PPP packet design, including all relevant header details.

1c) [12 Points]: Is your PPP protocol stateless? Explain.
**Problem 2**: You’ve been hired as a consultant by a company looking to start building Ethernet hardware. They’re considering building an “improved” Ethernet controller: Once the previous transmission ends, if this new controller has something to transmit, it always selects randomly from one of four possible wait values and delays the selected amount before transmitting.

**2a) [15 Points]**: Assuming all systems in a given network use this new approach, what advantages, if any, might this scheme have over basic Ethernet? Does it make a difference if there are some using the traditional approach and some using the new?

**2b) [15 Points]**: What disadvantages might this new approach have? Under what circumstances?
Problem 3: [30 Points] Answer the following questions as concisely as possible.

3a) Why does it make sense for the Internet to use packet switching instead of circuit switching?

3b) Why does the networking library have both a `send` and a `sendto`? When is each appropriate?

3c) What’s the difference between SMTP and POP? Why do we need both?