CS 372   **Introduction to Computer Networks**
Self-Check Exercises: Lecture 24   **Solutions**

1) Where do Network-layer protocols run?
   Everywhere in the internet! At the edge (host systems) and in the core (routers).

2) What is the purpose of the network layer?
   At a very high level, the purpose is to ensure logical communication from host to host. In a more nuts-and-bolts view, the purpose is to determine a path from source to destination that a datagram can take, and to move it on that path (within the network layer).

3) What is the difference between routing and forwarding?
   Routing is the process of determining the path a datagram will take from source to destination in the internet, whereas forwarding is the process within a router of moving a datagram from an input port to the appropriate output port, so that it may take the next step in its journey from source to destination.

4) What is a "first hop" router?
   The "first hop" router is the first router a datagram is passed to from the source host on the path to the destination host.

5) What is a virtual-circuit network? What are some benefits of this type of network?
   A connection-oriented network layer implies a virtual-circuit network. This type of network has a call setup at the beginning of a host-to-host connection, and from that point the state of the connection is preserved in all routers from source to destination, until the call is taken down. Some primary benefits of VC networks are guaranteed bandwidth and timing (jitter), which makes them ideal for streaming audio/video.

6) What is a datagram network? What are some benefits of this type of network?
   A connectionless network layer implies a datagram network. The internet is a datagram network. The advanatages are similar to those of UDP – there is FAR less overhead. Each network need not preserve the state for every host-to-host communication passing through it. With the billions of devices on the internet, this would be terribly implausible regardless of the rapid development of storage space and access times.

7) How does a router know which output port each one of the billions of IP addresses are located at?
   The forwarding table in a datagram network's router matches *ranges* of addresses to output ports, rather than matching each address to its own output port. By doing this, it saves tremendously on time and required storage/access capability.