1. Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that your local DNS server has cached the TLD Name Server's address. Thus, a number N of DNS servers are visited (starting with your local DNS server which has the cached entry for the TLD DNS) before your host receives the IP address from DNS. What is the number N of DNS servers visited? Assume the successive visits (including the local DNS) incur an RTT of $RTT_1, \ldots, RTT_N$. Further suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Let RTT_0 denote the RTT between the local host and the server containing the object. Assuming zero transmission time of the object, how much time elapses from when the client clicks on the link until the client receives the object? Ignore all transport protocol effects. (15 points)

2. Referring to Problem 1, suppose the HTML file references three (3) very small objects on the same server. Neglecting transmission times, how much time elapses with
   a. Non-persistent HTTP (with no parallel TCP connections)?
   b. Persistent HTTP (with no parallel TCP connections)?
   (15 points)

3. How does the "Last Modified" header line help in the HTTP protocol? (5 points)

4. Describe the use of the "If-Modified-Since" header in the HTTP protocol. (5 points)

5. What is the role of a HTTP proxy server in network? What does it do when it gets requests from a client browser and response from a server? What does it do

when it gets a subsequent request from a different client? (10 points)