This homework is due at the beginning of class on October 23, 2017 and is worth 1.5% of your grade.

Name: _____

CCIS Username: _____

Problem	Possible	Score
1	20	
2	15	
Total	35	

1. In this problem, we will use the useful `dig` tool available on Unix and Linux hosts to explore the hierarchy of DNS servers. You can read about it using `man dig`. Unfortunately, the Northeastern network has heavy restrictions on DNS traffic; if you do this homework from a location off-campus, then `dig` will function correctly. If you do this homework from campus, then we recommend using the online version of dig at `https://www.digwebinterface.com/`.

Recall that a DNS server higher in the DNS hierarchy delegates a DNS query to a DNS server lower in the hierarchy, by sending back to the DNS client the name of that lower-level DNS server (assuming no recursion is specified). *Hint: Be sure to use the +norecurse option to dig, and remember that you will need to specify different target DNS servers (@) each time.*

1a. Starting with a root DNS server (from one of the root servers `[a-m].root-servers.net`), initiate a sequence of queries using `dig` for the A record of `www.ccs.neu.edu` without using recursion. Be sure to show the list of the names of DNS servers in *the entire delegation chain* starting from the root. If there are multiple answers (NS or A records), you may simply choose one of them and proceed. (10 pts)

1b. (cont.) Repeat the same procedure as above for `www.google.com`. (10 pts)

2. Dynamic DNS is a protocol that enables a host to inform a DNS name server as its IP changes over time. For example, if a host reserves foo.bar.com, the host will tell the DNS server periodically what its current IP address is, and the server will update the DNS record to reflect this new IP address. This service is well-suited for hosts that do not have a long-lived (static) IP address.

2a. If you were designing Dynamic DNS, how would you prevent returning a stale IP-host name mapping even if the host's IP address frequently changes? (5 pts)

2b. (cont.) Given the answer to the previous question, is there a potential disadvantage of Dynamic DNS in terms of lookup latency performance for clients? (5 pts)

2c. (cont.) Suppose a web server behind a NAT is using Dynamic DNS. Explain what the DNS entry for this web server should look like and how to configure NAT in order to make the server publicly accessible (you may assume the web server uses the port 80). (5 pts)