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2. I completed this project by myself, as was indicated was allowed by the instructors. I consulted the project instructions, course slides related to the project, the mininet installation instructions that were referenced by the project description, as well as Google Gemini for additional help with mininet installation that the referenced instructions did not include.
3. I set up interface configurations using the <ip addr add …> command with the interface name after the "dev" keyword in each command to specify which device, or interface, I was mapping the IP address to. I set up default roots using the <ip route add> command with a similar usage of the first command except with a "default" keyword to indicate the addition of a default route. Since this is essentially a switch or star configuration (each host had its own connection the router), I set up the routes for each destination using the <ip route add> command with "r1" as the node (each command was essentially filling in the forwarding table for router "r1"), the respective host as the destination, and the IP address of the interface on the router intended to connect to that host as the argument after the "via" keyword.
4. All portions of the project work as required in the project description.
5. I encountered significant difficulties in actually configuring my mininet installation as was required for the project. Resolving these difficulties took me many hours, as it was an issue not addressed in the provided mininet description and an issue that multiple other people had posted questions about online with varying solutions. Looking through those solutions and trying to resolve my issue forced me to become familiar with tools and terminologies outside the scope of this course. Specifically, once I opened mininet in my VirtualBox, there was no way for me to move files between my mininet environment and my local PC. Both ssh'ing and using the provided "shared folder" features were not working with my mininet. Ssh was not working for the varying reasons I mentioned above, and the shared folder feature was not working because enabling it required me to open a terminal in the linux distribution the mininet environment was running in (outside of mininet itself), and after much troubleshooting with Google Gemini it was concluded that the provided mininet installation was too minimalistic or restrictive to allow such an operation. I had actually given up on completing the project and had asked for more help and an extension. Then, I returned to Google Gemini to try to resolve the ssh issue. There were varying solutions online, none of which worked, so instead of trying solutions blindly, I tried asking Gemini to explain a particular command or solution to me if I didn't have full knowledge of what it was actually doing. After doing this, I tried implementing a solution with the parameters Google Gemini provided. I set up a NAT network adapter with port forwarding enabled, using my PC's loopback address or "localhost" as my Host IP and letting VirtualBox fill in the guest IP. After this,

I was able to log in successfully. I had tried a previous solution online without using Google Gemini: that solution had the Guest IP in the Host IP slot for some reason. After that, I was able to complete the project.

6. I learned many technical observations/facts while trying to install mininet. I learned the difference between a Host IP and Guest IP when connecting to a virtual environment (Host IP is the IP address of the "host" or your host PC and Guest IP is the IP address of the "guest" or the virtual environment/OS you are running). I learned that port 22 may be blocked by firewalls for some reason. In terms of facts related to the course, I learned more about the commands needed to complete the project. I learned more about the <<node> ip route add ...> command: node is the name of the host or router whose routing table you want to modify, <destination> specifies the target you want to add the route to, via <gateway> specifies the IP address of the next-hop router or gateway if one is needed to send packets between the current node and the destination, and dev<interface> specifies the outgoing network interface on the node that packets should be sent out of. Within <destination>, you can specify different arguments: the "default" keyword used in the assignment is used to specify all packets with destinations that are not in the host's routing table (destinations that the host knows nothing about). Since each of our hosts in this assignment are only connected directly to the router, they know nothing about the other hosts. Therefore, instead of adding a separate <ip route add> command for each host-host connection, it is easier to just add one command per host with the "default" keyword, which just means to send packets with any destination to the device specified in the command. This results in just one line of code for each host vs three lines of code (4 lines of code total vs 12).