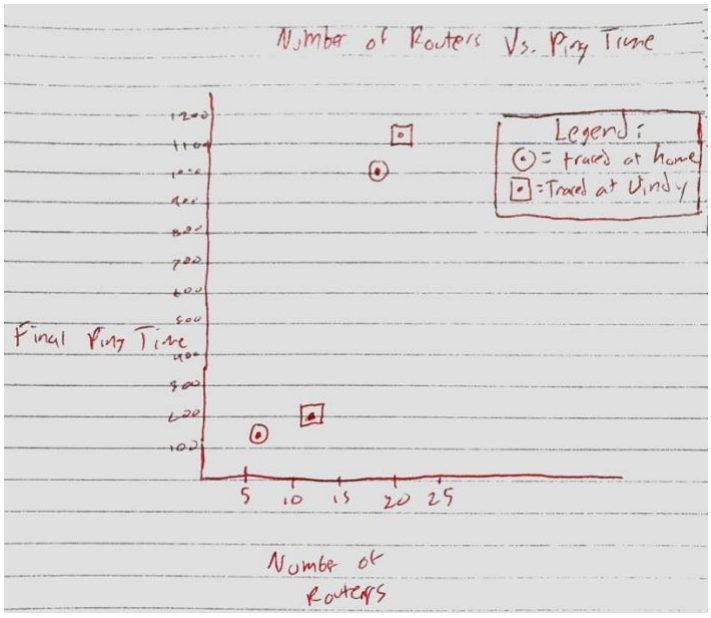
1. Answer to Question 1
    a. No. Just 5 people watching a 4k video on their laptops alone (5 * 15Mbps) is equal to their downstream of 75Mbps. Each member watching a video, updating facebook, and browsing the news is modeled by the expression:
    (5*15Mbps) + (1/10 * 10Mbps * 5) + (5* .1Mbps).
    this expression is equal to 80.5Mbps. 80.5Mbps / 75Mbps = 107.33% of downstream.
    b. Just 5, 5 4k videos increases the usage to 100% of downstream.
    c. 0.1^3
    d. 8,000,000Mb/ (75Mbps – (5 * .1Mbps)) = 107,382.55 seconds.
    e. 1Mbps (x) = 75, x = 75 people assuming the news only downloads 10% of the time.
2. Answer to Question 2
    a. the pings to Jagex.com: mean was 54.540 with a standard deviation of 2.398
    the pings to facebook.com: mean was 32.589 with a standard deviation of 1.24
    the pings to usa.com: mean was 45.841 with a standard deviation of 4.53
    the pings to Alaska.com: mean was 75.523 with a standard deviation of 5.631
    the pings to Egypt.com: mean was 58.828 with a standard deviation of 3.479
    b. 54.540 * 250000000
    32.589 * 250000000
    45.841 * 250000000
    75.523 * 250000000
    58.828 * 250000000

3. Answer to Question 3
    a. Yes.
    b. Yes, the graph of “Number of Routers vs. Total Ping Time” Indicates that there is a direct relationship between the number of routers of a traceroute and the total ping time.

c. 

4. Answer to Question 4
    a. Downloading 40 TB at a speed of 100 Mbps would take 320,000,000mb / 100mbps = 3200000, which is 37.03703704 days. 40 TB of data on hard drives could be FedEx'd in essentially one day, so FedEx is definitely faster. In order to download 40 TB of data in one day you would need 38 lines with a download speed of 100Mbps. Assuming a TB of data on a hard disk weighs roughly 3 lbs, 40 TB of data would weigh 120 lbs. The cost of overnight shipping a package weighing 120 lbs from New York to Indianapolis is about $900.00, therefore, assuming you sent 40TB of data every day, the monthly FedEx cost would be about $27,000.00, so if the dedicated lines cost the same as FedEx then the monthly rate would be about $27,000.00.
5. Answer to Question 5
    a. A_1 = 1 Gbps, A_2 = 10 Mbps, B = 1024 Kb, t = ?. Where A_1 is the ingoing link, A_2 is the outgoing link, B is the buffer, and t is the time it takes to fill the buffer. We'll use the formula
    $A_1 * t = B + (A_2 * t)$,
    Solving for t we get:
    $A_1t – A_2t = B$,
    $(A_1-A_2)t = B$,
    $t = B/(A_1 – A_2)$
    Plugging in the values we get:
    t= 1024000 / (1000000000– 10240000)
    t = 1024000 / 989760000
    t = 0.00103459424 seconds
    b. Assuming the buffer is full the additional latency added is modeled by the formula L = s / r, where c is the buffer size, and r is the rate of the channel.
    $L = 2^{20} / (10*2^{20})$
    L = .1 seconds