Question 1

In the first plot with a limit of 5 I see generally very similar lines in terms of slope. The lines themselves do not intersect or come anywhere near each other. The red line has the highest y intercept and the most linear slope out of the three. The green line has a curvature in its slope and intercepts y at 0. The blue line has a y-intercept of -1000 and has what appears to be a slope of close to 1 having an almost completely horizontal line.

Chart, line chart

Description automatically generated

The second plot tells a much differnet story than the first. The red line is still maintaining its slope from the first plot. However, things get interesting for the green line which now intersects with the red line, because beyond the limit of 5 to 15 we see exponentional growth in the green line. The green line now overtaking the red lands in a much higher y-posistion. The blue line also seems to be making an exponetional curve upwards but otherwise no change.

Chart, line chart

Description automatically generated

The third plot is ridiculous in terms of the differences from plot 2. Relatively the red line or linear line is much smaller and consistent than the green and blue lines. The blue line has completely overtaken both the green and red in terms of y position intersecting them both beyond an x-position of 15. The green line still maintains its position above red into the third plot and gains some y-distance. In general, between the three plots the linear/red function is the best in terms of keeping things low and consistent.

Chart

Description automatically generated

Below is the python code used.

A screenshot of a computer

Description automatically generated with medium confidence

Question 2: Asymptotic Notation

• Is 2(n+1.3) = O(2n)?

Yes, because n + 1.3 ~= n

• Is 3(2×n) = O(3n)?

No, because:

3^(2n) <= c \* 2^n

ln 3 \* 2n <= ln c + ln 2 \* n

2n <= ln c + n

n <= ln c

This last inequality does not make any sense since no number for c could make it true.

Question 3:

1. f (n)=(4 ×n)150 +(2 ×n +1024)400 vs. g(n)=20 ×n400 +(n +1024)200  
2. f (n)=n1.4 ×4n vs. g(n)=n200 ×3.99n  
3. f (n)=2log(n) vs. g(n)=n1024

Text, letter

Description automatically generated