Math 1152 Written Homework 6

Due: Thursday, June 23rd in Gradescope.

- Calculators are permitted EXCEPT those calculators that have symbolic algebra or calculus capabilities.
- SHOW ALL WORK!
- A completed version of this document is due to be uploaded to Gradescope by 11:59pm on **Thursday, June 23rd**.
- If you have difficulties using Gradescope, see pages under the Gradescope header in the Modules section of our Carmen page for help.
- Ideally, this can be completed on an iPad or android tablet using an app like One Note, Notability, Papyrus, etc. - if you don't have access to one of these options,then printing and scanning or using a smartphone document-scanning feature to generate a pdf to upload will also work.
- If you have difficulties uploading the assignment, email a pdf to your recitation instructor.
- This homework will be graded via random subset selection - not every part of every question will be looked at by the grader.
- Rubrics to applicable questions will be provided later.

Question 1. Recall the formula for the sum $\sum_{n=0}^{k} r^n$.

a. Reindex $\sum_{n=N+1}^{\infty} r^n$ so that the sum starts at 0.

b. Find a formula for $\sum_{n=N+1}^{\infty} r^n$.

c. Suppose that $S = \sum_{n=0}^{\infty} r^n$. What's a formula for

$$S - s_N,$$

where s_N is the Nth partial sum?

d. If $1/4 < r < 1/2$ and we want to approximate S to within $1/1000$, we can use the answer to Part c to solve for how large N needs to be. What we do is we set up an inequality

$$|S - s_N| < 1/1000$$

and try to solve for N; since the answer will depend on r, we will have to use the fact that $r \in \big(1/4, 1/2\big)$ to remove the dependence on r and determine what the smallest integer N can be is so that the inequality holds. (This should feel similar to what we do with the Comparison Test).

What is the smallest integer N so that s_N is within $1/1000$ of S for any r in $(1/4, 1/2)$?