PROBLEM I.3: PARTIAL SUM

ROSIE KEY

1. Equations Used

Series 1:

$$\sum_{i=1}^{n} \frac{\ln(i^4 + i + 3)}{\sqrt{i} + 3}$$

Series 2:

$$\sum_{i=1}^{n} \frac{e^{i/100}}{i^{10}}$$

Series 3:

$$\sum_{i=1}^{n} \frac{\sin(i^2 + 3i + 6)}{18^i}$$

2. Terms Created

Using anaconda, a program was created to to make a list containing the partial partial sums of three different equations at a length given by user input. Then, the first 15 and last 15 terms of the list would be printed. Below are the outputs for the input N=1000:

First 15

Series 1	Series 2	Series 3
0.40235948	1.01005017	-0.0302234
1.09206839	1.01104646	-0.03111199
2.03582582	1.01106391	-0.03126726
3.15025663	1.0110649	-0.03126222
4.38218686	1.01106501	-0.03126175
5.69863274	1.01106503	-0.03126175
7.07804116	1.01106503	-0.03126175
8.50560436	1.01106503	-0.03126175
9.9707253	1.01106503	-0.03126175
11.46556861	1.01106503	-0.03126175
12.98418609	1.01106503	-0.03126175
14.52196355	1.01106503	-0.03126175
16.07525669	1.01106503	-0.03126175
17.6411434	1.01106503	-0.03126175
19.21725028	1.01106503	-0.03126175

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Last 15

Series 1	Series 2	Series 3
1034.5001308	1.01106503	-0.03126175
1035.30145095	1.01106503	-0.03126175
1036.10251846	1.01106503	-0.03126175
1036.90333363	1.01106503	-0.03126175
1037.70389674	1.01106503	-0.03126175
1038.50420811	1.01106503	-0.03126175
1039.30426804	1.01106503	-0.03126175
1040.10407682	1.01106503	-0.03126175
1040.90363475	1.01106503	-0.03126175
1041.70294214	1.01106503	-0.03126175
1042.50199927	1.01106503	-0.03126175
1043.30080644	1.01106503	-0.03126175
1044.09936395	1.01106503	-0.03126175
1044.8976721	1.01106503	-0.03126175
1045.69573117	1.01106503	-0.03126175

3. Conclusion

Given the results above, Series 2 and Series 3 converge at 1.101106503 and -0.03126175 respectively. Series 1, however, diverges since the numerator grows faster than the denominator. All series were tested with 1000 terms, and Series 1 was tested again with 2000 terms. In order to determine where a partial sum series converges, there needed to be a large enough input that did not overwork the program, so 1000 was an ideal choice.