Hayden White Python & Sequences Exercises

1. A quick google image search reveals that there is actually a formula for the sum of the first *n* terms in a geometric sequence. Here is what we found:

$$Sum = \frac{t_1(1-r^n)}{1-r}$$

Pick three geometric series with some variation in the *r* (common multiplier), *n* (number of terms) and t_1 (first term).

Verify that your program produces the same sum as this formula.

$T_{1=}$ 5, r = 2, n = 5 ---> Success
$T_{1=}$ 4, r = 4, n = 6 ---> Success
$T_{1=}$ 2, r = 3, n = 3 ---> Success
Conclusion: Code matches formula

2. Use your program to fill in the following table:

t_1	r	S_1	S_{10}	S_{100}	S_{1000}
10	1.1	10	159.37	1377961.23	2.4699329180060233e+43
10	0.5	10	19.98046875	20.0	20.0
10	-0.3	10	7.6922622700000005	7.692307692307691	7.692307692307691
10	-1.3	10	-55.59064863	-1077971787372.1655	-3.8161415099886133e+114

Based on your values above, what can you say about the value of S_n as for large *n* ?

Describe the different scenarios you see and under what conditions they occur. Illustrate with examples.

Based on my calculations, two scenarios can occur as n in the sum of the first n terms of a given sequence get bigger. If r, the common multiplier, is less than 1 and greater than -1, then the sum of the first n terms will begin to change less as n gets bigger. Eventually, when n gets large, the sum of the first n terms will barely change. The opposite of this scenario occurs when r is greater than 1 and less than -1. When this happens, the absolute value of the sum of the first n terms will increase exponentially as n gets larger. In the examples above, we saw that as n reached 1000 S became extremely massive. On a side note, it is important to recognize the effect of a negative common multiplier on the sum of the first n terms. When r is negative and less than -1, S will bounce between positive and negative numbers while the absolute value of S increases. When r is negative and greater than -1, S will remain positive or negative depending on the first term instead of bouncing back and forth. While a negative common multiplier changes the sum of the first n terms' behavior, the end product is still similar to its positive counterpart.