Series Assignment

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Series Assignment

Question 0

Watch the lecture video here.

Did you watch the video? [Type yes or no.]

Question 1

Find the sum of the following geometric series in two ways:

1. Using the sum command in Sage.
2. Using the formula $\frac{a}{1-r}$.

(You should get the same answer).

Part a

$$1+\frac{1}{3}+\frac{1}{9}+\frac{1}{27}+\cdots$$

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1
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Part b

$$\frac{1}{2}+\frac{1}{8}+\frac{1}{32}+\frac{1}{128}+\cdots$$

2

3

Part c

$$\sum_{n=0}^{\infty} 4\left(-\frac{1}{5}\right)^n$$

Question 2

Consider the series $\sum_{n=1}^{\infty} (n \cdot r^n)$.

Part a

Find the sum of this series for the following values of r: $-2,\ -1,\ -\frac{7}{8},\ -\frac{1}{2},\ \frac{1}{2},\ \frac{7}{8},\ 1,\ 2$.

Part b

Make a conjecture (an educated guess): for what values of r does this series converge?

[Note: I'm asking about r in general, not the values from part a.]

Question 3

Check that $\sum_{n=1}^{\infty} \frac{\sin(n)}{n} = \frac{\pi - 1}{2}$.

(Sage will give you some strange-looking output, but you can simplify it, since $\tan = \sin / \cos$.)

Question 4

Find the 10th, 100th, and 1000th partial sums of the series $\sum_{n=1}^{\infty} \frac{n!}{n^n}$. Do you think the series converges?

[Use factorial(n) for $n!$]

[Hint: You'll want to convert to a decimal using the N() command.]

Question 5

Find the 10th, 100th, and 1000th partial sums of the series $\sum_{n=1}^{\infty} \frac{n^n}{n!}$. Do you think the series converges?

[Hint: Watch out for scientific notation in the answers.]