Summation of Series [1]

1. Enter the commands:
   ```
   syms x k
   format long
   ```

2. Enter: `symsum(.5^k,0,inf)`
   What kind of series is this? Is the result of the computation an approximation or is it exact? How fast did it produce an value for this infinite series? Do you think it was done numerically or symbolically?

3. Enter: `symsum(.5^k, 0, 10)` followed by `double(ans)`.
   Here `n = 10`. Increase n gradually until 5 decimal places of accuracy are reached.

4. Enter: `symsum(.99^k, 0, inf)` and `symsum(.99^k, 0, 10)`
   Again increase `n` until 5 decimal places of accuracy are reached. Compare this with the value of n in the previous computation, i.e., what is the difference and what causes it?

5. Try to repeat the process used in #2 and #3 for the series $\sum_{k=1}^{\infty} \frac{1}{k^{1.1}}$.
   (Type: `symsum(k^-1.1,1,inf)`)
   How fast was this computation? Is the answer exact or approximate? Was it done symbolically or numerically? Using an integral estimate (by hand), how many terms are needed for 5 decimal places accuracy? Try to sum this many terms and obtain a decimal approximation.

6. Try to guess what the results of the command: `symsum(x^k/sym('k!'), k, 0, inf)` will be, then enter it. Think about how amazing this computation is.

7. Prepare a brief (< 1 page) written report describing what happened and answering the questions. Use complete sentences and standard mathematical notation. Do **not** get a printout.

Symbolic summation and rate of convergence are considered. For series to be useful for numerical calculations, convergence must be relatively fast. Series which converge slowly are only useful in symbolic computations. Computer algebra systems, such as in MATLAB, can perform symbolic computations.