

# The Bright Side of Mathematics

Problem 1:

Check whether the following two series converge or diverge:

$$(a) \sum_{n=1}^{\infty} \frac{n!}{n^n}$$

$$(b) \sum_{n=2}^{\infty} \frac{n+5}{n^2-2n+1}$$

Problem 2:

Consider the series  $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$

(a) Show, by using a partial fraction decomposition, that the series is convergent with limit 1.

Consider now the series  $S = \sum_{n=1}^{\infty} \frac{1}{4n^2-1}$

(b) Show, by using (a), that the series is convergent.

(c) Calculate the limit of the series by applying a partial fraction decomposition.