

Name: _____

/ 25

30 minutes maximum. No aids (book, calculator, etc.) are permitted. Show all work and use proper notation for full credit. Answers should be in reasonably-simplified form. 25 points possible.

1. [3 points] Find a formula for the n th term a_n of the following recursively defined sequence:

$$a_1 = 1 \text{ and } a_{n+1} = (n+1)a_n \text{ for } n \geq 1$$

2. [4 points] Determine the limit of the sequence or explain why the sequence diverges:

$$a_n = \ln\left(\frac{n+2}{n^2-3}\right)$$

3. [4 points] Compute and simplify the fourth partial sum S_4 of the series $\sum_{n=1}^{\infty} a_n$ which has n th term
- $$a_n = \frac{1}{n}.$$

4. [4 points] Use sigma notation to write a simplified expression for the infinite series.

$$1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} - \dots$$

5. [10 points] State whether the given series converges or diverges, and explain why. If the series converges, find its sum.

a. $1 + \frac{e}{\pi} + \frac{e^2}{\pi^2} + \frac{e^3}{\pi^3} + \dots$

b. $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$

EC. [1 points] (Extra Credit) Write the repeating decimal $x = 2.787878 \dots = 2.\overline{78}$ as a rational number. That is, find integers N and M so that $x = N/M$.

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