

Name _____ Date _____ Period _____

Worksheet 8.1—Sequences & Series: Convergence & Divergence

Show all work. No calculator except unless specifically stated.

Short Answer

1. Determine if the sequence $\left\{ \frac{\ln n}{n^2} \right\}$ converges.

2. Find the n th term (rule of sequence) of each sequence, and use it to determine whether or not the sequence converges.

(a) $2, \frac{3}{4}, \frac{4}{9}, \frac{5}{16}, \frac{6}{25}, \dots$

(b) $1, \frac{1}{2}, \frac{1}{6}, \frac{1}{24}, \frac{1}{120}, \dots$

3. (Calculator Permitted) For $\sum_{n=1}^{\infty} \left(\frac{1}{n+1} - \frac{1}{n+3} \right)$,

(a) Find S_3

(b) using your calculator, calculate S_{500} (Calculator entry shown at right.)

```
sum(seq(1/(N+1)-
1/(N+3),N,1,500))
```

4. Find the sum: $\sum_{n=1}^{\infty} \frac{(-1)^{n+1} 3^n}{8^n}$

5. Use the indicated test for convergence to determine if the series converges or diverges. If possible, state the value to which it converges.

(a) Geometric Series: $3 + \frac{15}{4} + \frac{75}{16} + \frac{375}{64} + \dots$

(b) Geometric Series: $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \frac{1}{64} + \dots$

6. (Calculator permitted) To five decimal places, approximate the sum of $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$ using S_5 .

Determine whether or not the series converge using the appropriate convergence test (there may be more than one applicable test.) State the test used. If possible, give the sum of the series.

7. $\sum_{n=0}^{\infty} \left(\frac{2}{7}\right)^n$

8. $\sum_{n=0}^{\infty} \left(\frac{7}{2}\right)^n$

9. $\sum_{n=1}^{\infty} \left(-\frac{3}{10}\right)^n$

10. $\sum_{n=1}^{\infty} -\left(\frac{3}{10}\right)^n$

11. $\frac{1}{5} + \frac{1}{6} + \frac{1}{7} + \frac{1}{8} + \frac{1}{9} + \dots$

12. $2 + \frac{1}{2} + \frac{1}{8} + \frac{1}{32} + \dots$

13. $\sum_{n=1}^{\infty} \frac{3^n + 4}{2^n}$

14. What is the sum of the following:

(a) $\sum_{n=0}^{\infty} \frac{3}{2^n}$

(b) $\sum_{n=2}^{\infty} \left(-\frac{3}{2}\right)^{-n}$

Multiple Choice:

_____ 15. Which of the following series converge?

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

II. $\sum_{n=1}^{\infty} \left(\frac{5}{6}\right)^{-n}$

III. $\sum_{n=8}^{\infty} (-1)^n \left(\frac{5}{7}\right)^n$

- (A) None (B) II only (C) III only (D) I and II only (E) I and III only

_____ 16. For what integer k , $k > 1$, will both $\sum_{n=1}^{\infty} \frac{(-k)^n}{5^n}$ and $\sum_{n=1}^{\infty} \left(\frac{k}{4}\right)^n$ converge?

- (A) 6 (B) 5 (C) 4 (D) -4 (E) -3