

Name \_\_\_\_\_ Date \_\_\_\_\_

Instructions: Please show all of your work as partial credit will be given where appropriate, **and** there may be no credit given for problems where there is no work shown. All answers should be completely simplified, unless otherwise stated.

Every question is worth 10 points.

**Part 1:** Determine if each series converges absolutely, converges conditionally, or diverges. Show all your work, state which tests you used, and explain your reasoning.

1. 
$$\sum_{n=2}^{\infty} \frac{\cos(n\pi)}{3n}$$

Converges Absolutely    or    Converges Conditionally    or    Diverges    (circle one)

Why/Test Used?

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2. 
$$\sum_{n=2}^{\infty} \frac{\sqrt{n}(-4)^n}{(3n-1)!}$$

Converges Absolutely    or    Converges Conditionally    or    Diverges    (circle one)

Why? \_\_\_\_\_

3. 
$$\sum_{n=1}^{\infty} \frac{(-1)^n (n^2 + 1)}{8n^5 - n^2}$$

Converges Absolutely    or    Converges Conditionally    or    Diverges    (circle one)

Why/Test Used?

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4.  $\sum_{n=1}^{\infty} \frac{9n}{\csc(n^2)}$

Converges Absolutely   or   Converges Conditionally   or   Diverges   (circle one)

Why/Test Used?

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5.  $\sum_{m=1}^{\infty} 9m^2 e^{-m^3+5}$

Converges Absolutely    or    Converges Conditionally    or    Diverges    (circle one)

Why/Test Used?

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**Part 2:** Rewrite each sum as an infinite series in summation notation, and then determine if each series converges or diverges. **If it converges, find its sum.**

6.  $\ln\left(\frac{3}{7}\right) + \ln\left(\frac{7}{11}\right) + \ln\left(\frac{11}{15}\right) + \ln\left(\frac{15}{19}\right) + \dots =$  \_\_\_\_\_  
(series representation)

Converges    or    Diverges    (circle one)

If it converges, sum = \_\_\_\_\_.

7.  $0.135353535 \dots =$  \_\_\_\_\_  
(series representation)

Converges or Diverges (circle one)

If it converges, sum (**in exact fraction form**) = \_\_\_\_\_.

**Part 3:** Answer each question.

8. Find a power series that represents  $f(x) = \frac{4x^2}{1-5x} + 3x^2 - 3$  and state its radius of convergence.

Power Series: \_\_\_\_\_

Radius of convergence: \_\_\_\_\_

9. For the sequence given by  $a_n = \frac{n^2 + 2n + 1}{\sqrt{2n^4 - 1}}$

(a) List the first three terms of the sequence.

n	$a_n$
1	
2	
3	

(b) Determine whether  $\{a_n\}$  converges or diverges. If it converges, find  $\lim_{n \rightarrow \infty} a_n$ .

Converges or Diverges (circle one)

If it converges,  $\lim_{n \rightarrow \infty} a_n =$  \_\_\_\_\_

10. Find the convergence set for the power series  $\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{3^{n+1}(2n+5)}$  .

convergence set: \_\_\_\_\_