

## Math 121 Series Worksheet

Create a Series that meets each of the given challenges. Name any convergence test(s) that you use, and justify all of your work

1. Create a Series that **Diverges by the  $n^{\text{th}}$  Term Divergence Test** and requires L'Hôpital's Rule in the nTDT Limit. Continue on to justify that the series is Divergent by the nTDT.

2. Create an Alternating Series that **Converges by the Geometric Series Test**. Try to make one with many term pieces. Continue on to justify that the series is Convergent by the GST.

3. Create an Alternating Series that **Converges by the Absolute Convergence Test**. You cannot choose *just*  $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^p}$ . Continue on to justify that the series is Convergent by the ACT.

4. Create an Alternating Series that **Converges Absolutely by the Ratio Test**. You cannot choose *just* a Geometric Series. Continue on to prove that this series is Absolutely Convergent.

5. Create an Alternating Series that **Diverges by the Ratio Test**. You cannot use *just* a Geometric Series or just the *flip* of the terms in 4 above. Continue on to prove that this series is Divergent.

6. Create an Alternating Series which is **Absolutely Convergent**. You cannot choose *just*  $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^p}$  or a Geometric Series. Continue on to justify that this series is Absolutely Convergent.

7. Create an Alternating Series which is **Conditionally Convergent**. You cannot choose *just*  $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^p}$ . Continue on to justify that this series is Conditionally Convergent.

8. Create a series that is **Convergent by the Comparison Test**. You cannot use *just* a p-series. Continue on to prove that this series is Convergent. Next, what about Divergent?

9. Create a series that is **Divergent by the Limit Comparison Test**. You cannot use *just* a p-series. Continue on to prove that this series is Divergent. Next, what about Convergent?

10. Create a series that is **Divergent by the Integral Test**. You cannot use *just* a p-series. Continue on to prove that this series is Divergent. Next, how about Convergent?

11. Create a Series that can be proven to be **Convergent** using two different methods. If you use a Comparison, then you are only allowed to use one of the Comparison Tests. Continue on to prove that this series is Convergent. How about Three different methods? How about Divergent?