Name:______________________________

MA 2733 Section 52 | *Practice Exam 1* | *November 19, 2019*

Follow the instructions for each question and show enough of your work so that I can follow your thought process. If I can't read your work, answer or there is no justification to a solution, you will receive little or no credit!

For problems 1 and 2, determine if the following sequences coverge or diverge. If it converges find its limit.

1. $a_n = \ln(n+1) - \ln n$

2. $a_n = \dfrac{(2n)!}{(3n)!}$

For problems 3 and 4, find the sum of the following convergent series:

3. $\displaystyle\sum_{n=1}^{\infty} \frac{2^n + e^n}{\pi^n}$

4. $\displaystyle\sum_{n=1}^{\infty} \left(e^{\frac{1}{n}} - e^{\frac{1}{n+1}}\right)$

For problems 5 - 10, determine if the following series converge or diverge.

5. $\displaystyle\sum_{n=1}^{\infty} ne^{-n}$

6. $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n \ln n}$

7. $\displaystyle\sum_{n=1}^{\infty} \frac{n \sin^2 n}{1+n^3}$

8. $\displaystyle\sum_{n=1}^{\infty} \sin\left(\frac{1}{n}\right)$

9. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{\sqrt{n}}{2n+3}$

10. $\displaystyle\sum_{n=1}^{\infty} (-1)^{n-1} \tan^{-1}(n)$

For problems 11 and 12, determine if the following series converge absolutely, conditionally or diverges.

11. $\displaystyle\sum_{n=1}^{\infty} \frac{n!}{n^n}$

12. $\displaystyle\sum_{n=1}^{\infty} \left(1+\frac{1}{n}\right)^{n^2}$

13. If the n^{th} partial sum of the series $\displaystyle\sum_{n=1}^{\infty} a_n$ is

$$s_n = 3 - n2^{-n}$$

find a_n and compute the sum $\displaystyle\sum_{n=1}^{\infty} a_n$