Name : _____ **Class Number:** _____

Math 1C: INA Lesson 4 Suggested Problems

Theoretic Problems: Discussed in-class

---

1. **Ratio and Root Test**
   - A. State the ratio test for convergence of a series with positive terms.
   - B. State the root test for convergence of a series with positive terms.
   - C. State the direct comparison test for convergence of a series with positive terms.
   - D. State the limit comparison comparison test for convergence of a series with positive terms.
   - E. Discuss the guidelines for choosing a test for series containing positive terms.

Problems Solved in Jeff's Handwritten Notes

---

2. Example 8.5.1a p. 641: Determine if the following series converges

$$\sum_{n=1}^{\infty} \frac{10^n}{n!}$$

---

3. Example 8.5.1b p. 641: Determine if the following series converges

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

---

4. Example 8.5.1c p. 641: Determine if the following series converges

$$\sum_{n=1}^{\infty} e^{-n}\left(n^2+4\right)$$

---

5. Can we use the ratio test to analyze the convergence behavior of the harmonic series? Why or why not?

---

6. Example 8.5.2a p. 643: Determine if the following series converges

$$\sum_{n=1}^{\infty} \left[\frac{4n^2-3}{7n^2+6}\right]^n$$

---

7. Example 8.5.2b p. 643: Determine if the following series converges

$$\sum_{n=1}^{\infty} \frac{2^n}{n^{10}}$$

8. Use the direct comparison test to check the following series for convergence:

$$\sum_{n=1}^{\infty} \frac{1}{2^n + 1}$$

9. Use the direct comparison test to check the following series for convergence:

$$\sum_{n=1}^{\infty} \frac{5}{2n^2 + 4n + 3}$$

10. Use the direct comparison test to check the following series for convergence:

$$\sum_{n=1}^{\infty} \frac{\ln(n)}{n}$$

11. Use the limit comparison test to check the following series for convergence:

$$\sum_{n=1}^{\infty} \frac{1}{2^n - 1}$$

Why is it a little harder to use the direct comparison test here?

12. Use the limit comparison test to check the following series for convergence:

$$\sum_{k=1}^{\infty} \frac{5k^4 - 2k^2 + 3}{2k^6 - k + 5}$$

Suggested Problems

13. Use the test of your choice to determine if the following series converge or diverge:

A. $\displaystyle\sum_{k=1}^{\infty} \frac{(k!)^3}{(3k)!}$ B. $\displaystyle\sum_{k=1}^{\infty} \frac{1}{5^k - 3^k}$ C. $\displaystyle\sum_{k=1}^{\infty} \frac{k^{100}}{(k+2)!}$ D. $\displaystyle\sum_{k=2}^{\infty} \frac{1}{k^2 \ln(k)}$

E. $\displaystyle\sum_{k=1}^{\infty} \frac{1}{k^{3/2} + 1}$ F. $\displaystyle\sum_{k=1}^{\infty} \frac{k}{e^k + 3k}$ G. $\displaystyle\sum_{k=1}^{\infty} 50k^{-k}$ H. $\displaystyle\sum_{k=1}^{\infty} \frac{2^k - 1}{k^k + 1}$