

10 Please indicate **T** or **F** false.

1. **T** / **(F)**: For  $c \neq 0$ , the geometric series  $\sum cr^n$  converges if  $|r| \leq 1$ . *must be strictly less than.*

2. **(T)** / **F**: The telescoping series

$$\left(1 - \frac{1}{2}\right) + \left(\frac{1}{2} - \frac{1}{3}\right) + \left(\frac{1}{3} - \frac{1}{4}\right) + \left(\frac{1}{4} - \frac{1}{5}\right) + \left(\frac{1}{5} - \frac{1}{6}\right) + \dots$$

converges to 1.

$$S_n = 1 - \frac{1}{n+1} \xrightarrow{n \rightarrow \infty} 1$$

3. **T** / **(F)**: The telescoping series

$$\left(\ln 1 - \ln \frac{1}{2}\right) + \left(\ln \frac{1}{2} - \ln \frac{1}{3}\right) + \left(\ln \frac{1}{3} - \ln \frac{1}{4}\right) + \left(\ln \frac{1}{4} - \ln \frac{1}{5}\right) + \left(\ln \frac{1}{5} - \ln \frac{1}{6}\right) + \dots$$

converges to  $\ln 1 = 0$ .

$$S_n = \ln 1 - \ln \frac{1}{n+1} \xrightarrow{n \rightarrow \infty} \infty$$

4. **T** / **(F)**: The geometric series

$$1 + \frac{5}{2} + \frac{25}{4} + \frac{125}{8} + \frac{625}{16} + \dots$$

converges to  $\frac{1}{1 - \frac{5}{2}}$ .

$$\left|\frac{5}{2}\right| > 1$$

5. **(T)** / **F**: The geometric series

$$1 - \frac{2}{5} + \frac{4}{25} - \frac{8}{125} + \frac{16}{625} - \dots$$

converges to  $\frac{1}{1 + \frac{2}{5}}$ .

6. **(T)** / **F**: If  $a_n \rightarrow 0$  as  $n \rightarrow \infty$ , the sequence  $\{a_n\}$  converges.

7. **T** / **(F)**: If  $a_n \rightarrow 0$  as  $n \rightarrow \infty$ , the series  $\sum a_n$  converges. *See #10 for a counter example*

8. **(T)** / **F**: If  $a_n \rightarrow 2$  as  $n \rightarrow \infty$ , the sequence  $\{a_n\}$  converges.

9. **T** / **(F)**: If  $a_n \rightarrow 2$  as  $n \rightarrow \infty$ , the series  $\sum a_n$  converges.

10. **T** / **(F)**: The Harmonic series

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

converges.