

**Directions:** Test the following series for convergence or divergence. In each problem, specify which test you will use, and verify that the hypotheses are satisfied before making a conclusion. Number 9 is extra credit!

Please do me a favor and clearly organize / separate your work for each problem! Thanks.

1. 
$$\sum_{k=2}^{\infty} \frac{1}{k(\ln k)^2}$$

4. 
$$\sum_{k=1}^{\infty} \frac{(-1)^{k+1}}{3k+4}$$

2. 
$$\sum_{k=1}^{\infty} \frac{k+1}{k(k+2)}$$

5. 
$$\sum_{k=1}^{\infty} \frac{k!}{k^2}$$

3. 
$$\sum_{k=1}^{\infty} \frac{1}{e^k}$$

6. 
$$\sum_{k=1}^{\infty} \cos\left(\frac{1}{k^2}\right)$$

$$7. \sum_{k=1}^{\infty} \frac{(-1)^{k+1}(k+3)}{k(k+1)}$$

$$11. \sum_{k=1}^{\infty} \left(\frac{\ln k}{k}\right)^k$$

$$8. \sum_{k=1}^{\infty} \frac{k!}{2^k}$$

$$12. \sum_{k=1}^{\infty} \frac{k+1}{k^3+1}$$

$$9. \text{(E.C.)} \sum_{k=1}^{\infty} \frac{\ln k}{(k+1)^2}$$

$$13. \sum_{k=1}^{\infty} \frac{\sqrt{k}}{k^2+1}$$

$$10. \sum_{k=1}^{\infty} \frac{k^k}{5^{k+1}}$$

$$14. \sum_{k=1}^{\infty} \frac{(-1)^k(2k-1)}{3^k}$$