

4. [10 points] Determine whether the following series converge or diverge. Show all of your work and justify your answer.

a. [5 points]  $\sum_{n=1}^{\infty} \frac{8^n + 10^n}{9^n}$

*Solution:*  $\lim_{n \rightarrow \infty} \frac{8^n + 10^n}{9^n} = \infty$  therefore by the  $n^{\text{th}}$  term test the series diverges.

b. [5 points]  $\sum_{n=4}^{\infty} \frac{1}{n^3 + n^2 \cos(n)}$

*Solution:*  $\sum_{n=4}^{\infty} \frac{1}{n^3 + n^2 \cos(n)} \leq \sum_{n=4}^{\infty} \frac{1}{n^2(n-1)} \leq \sum_{n=4}^{\infty} \frac{1}{n^2}$ . The final series is a convergent  $p$  series since  $p = 2 > 1$ . Therefore the original series converges by comparison.