

WRITE YOUR NAME:

MAC 2312 Quiz 4  
Friday April 6th

Question 1. Determine whether the series converges or diverges.

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

Try ratio test.  $a_k = \frac{k^5}{2^k}$   $a_{k+1} = \frac{(k+1)^5}{2^{k+1}}$

$$\lim_{k \rightarrow \infty} \frac{a_{k+1}}{a_k} = \lim_{k \rightarrow \infty} \left( \frac{(k+1)^5}{2^{k+1}} \div \frac{k^5}{2^k} \right)$$

$$= \lim_{k \rightarrow \infty} \left( \frac{(k+1)^5}{2^{k+1}} \cdot \frac{2^k}{k^5} \right) = \lim_{k \rightarrow \infty} \left( \underbrace{\frac{(k+1)^5}{k^5}}_{\rightarrow 1} \cdot \underbrace{\frac{2^k}{2^{k+1}}}_{= \frac{1}{2}} \right)$$

$$\frac{k^5 + \text{smaller}}{k^5}$$

$$= 1 \cdot \frac{1}{2} < 1. \text{ Since } \lim_{k \rightarrow \infty} \frac{a_{k+1}}{a_k} = \frac{1}{2} < 1,$$

We can conclude  $\sum a_k$  CONVERGES by ratio test