Name: Solutions

MAT 128
Quiz 5

Determine whether the sequence converges or diverges.

1. $a_n = \frac{3^{n+2}}{5^n} = 3^2 \cdot \left(\frac{3}{5}\right)^n$ $\quad r = \frac{3}{5} < 1$

converges to 0

$\Rightarrow$ a_n conv to 0

2. $a_n = \frac{(2n-1)!}{(2n+1)!} = \frac{1 \cdot 2 \cdot 3 \cdots (2n-1)}{1 \cdot 2 \cdot 3 \cdots (2n-1)(2n)(2n+1)}$

$\Rightarrow \lim_{n \to \infty} a_n = \lim_{n \to \infty} \frac{1}{(2n)(2n+1)} = 0$

$\Rightarrow$ conv. to 0

3. $a_n = \frac{(\cos n)^2}{2^n} < \frac{1}{2^n}$

$0 < a_n < \frac{1}{2^n}$ and $\frac{1}{2^n} \to 0$

$\Rightarrow$ a_n conv to 0

4. $a_n = \frac{(-3)^n}{n!} = (-1)^n \frac{3 \cdot 3 \cdot 3 \cdot 3 \cdots 3}{1 \cdot 2 \cdot 3 \cdot 4 \cdots n}$

$\Rightarrow |a_n| = \frac{9}{2} \cdot \frac{3}{4} \cdot \frac{3}{5} \cdots \frac{3}{n} < \frac{9}{2} \cdot \left(\frac{3}{4}\right)^n \to 0$

$\Rightarrow |a_n| \to 0$

$\Rightarrow$ a_n conv to 0