$\lim_{k\to\infty} \frac{\tan^{-1}k}{1+3^k} \approx \frac{\frac{\pi}{2}}{3^k}$

$\sum_{k=1} \frac{\tan^{-1}k}{1+3^k} \quad \sum_{k=1} \frac{\frac{\pi}{2}}{3^k}$

$\frac{\pi}{2}$

Gavin McKay

1. $\sum_{k=1}^{\infty} \frac{\tan^{-1}k}{1+3^k} \leq \sum_{k=1}^{\infty} \frac{\frac{\pi}{2}}{3^k} = \lim_{k\to\infty} \frac{\tan^{-1}k \cdot 3^k}{1+3^k}$

$r = 1/3$

$\frac{\pi}{2} \sum_{k=1}^{\infty} \frac{1}{3^k} \quad \frac{\pi}{2} \sum_{k=1}^{\infty} \left(\frac{1}{3}\right)^k$

$r < 1$ • GST

• Series converges by comparisons tests

$n = 4$

2. $|R_n| \leq A_{k+1} \qquad A_k = \frac{1}{n^2+1}$

$|R_n| \quad \frac{1}{(n+1)^2+1}$

$n=4 \qquad R_n \leq \frac{1}{(5)^2+1} = \boxed{\frac{1}{26}\ ?}$

3. ✓ $\lim_{k\to\infty} \frac{k+1}{k^2+8} = 0$

$f'(x) = \frac{1(k^2+8) - (k+1)(2k)}{(k^2+8)^2} = \frac{\cancel{k^2}+8 - 2k^2 + 2k}{(k^2+8)^2}$

$f'(x) = -\frac{k^2+2k}{(k^2+8)}$

✓ • Non increasing • Converges by the A.S.T

4. $\sum_{k=1}^{\infty} \frac{k+1}{k^2+8} \approx \sum_{k=1}^{\infty} \frac{1}{k} \qquad \frac{1}{k^1} \qquad p=1$, Diverges

RASNT

- P series Test

$\lim_{k\to\infty} \frac{k+1}{k^2+8} \cdot \frac{k}{1} \quad \lim_{k\to\infty} \frac{k^2+k}{k^2+8} = 1$ Diverges by L.C.T

5. Converges conditionally - because

$\sum_{k=1}^{\infty} \left| (-1)^k \frac{k+1}{k^2+8} \right|$ causes the series to diverge when it otherwise ~~diverged~~ converged