Answer the questions in the spaces provided. If you run out of room for an answer, continue on the back of the page.

Student's Name: _____

Instructor's name: _____

Do the following series converge or diverge?

1.

$$\sum_{n=1}^{\infty} \frac{3^{1-2n}}{n^2+1}$$

$$L = \lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| = \lim_{n\to\infty} \left|a_{n+1}\frac{1}{a_n}\right| = \lim_{n\to\infty} \left|\frac{3^{1-2(n+1)}}{(n+1)^2+1}\frac{n^2+1}{3^{1-2n}}\right|$$

$$= \lim_{n\to\infty} \left|\frac{3^{-1-2n}}{(n+1)^2+1}\frac{n^2+1}{3^{1-2n}}\right| = \lim_{n\to\infty} \left|\frac{1}{(n+1)^2+1}\frac{n^2+1}{3^2}\right| = \lim_{n\to\infty} \left|\frac{n^2+1}{9\left[(n+1)^2+1\right]}\right| = \frac{1}{9}$$

We can see that $L = \frac{1}{9} < 1$ thus by the Ratio Test the series converges.