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.

$$\sum_{n=0}^{\infty} \frac{(2n)!}{5n+1}$$

$$L = \lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| = \lim_{n\to\infty} \left|a_{n+1}\frac{1}{a_n}\right| = \lim_{n\to\infty} \left|\frac{(2(n+1))!}{5(n+1)+1}\frac{5n+1}{(2n)!}\right|$$
$$= \lim_{n\to\infty} \left|\frac{(2n+2)!}{5n+6}\frac{5n+1}{(2n)!}\right| = \lim_{n\to\infty} \left|\frac{(2n+2)(2n+1)(2n)!}{5n+6}\frac{5n+1}{(2n)!}\right|$$
$$= \lim_{n\to\infty} \left|\frac{(2n+2)(2n+1)(5n+1)}{5n+6}\right| = \infty$$

We can see that $L = \infty > 1$ thus by the Ratio Test the series diverges.