Math 141
Quiz 6
Due no later than April 3rd in class
For problems, #1 - #4

- Test the series for convergence or divergence.
- Name the test utilized.
- Support your conclusion.
- If convergent, find the sum, whenever possible.

1. \[ \sum_{n=1}^{\infty} \frac{n}{2n+1} \]

Test Name: **nth term test for div.**
Apply Test:
\[
\lim_{n \to \infty} \frac{n}{2n+1} = \frac{1}{2} \neq 0
\]
series diverges

Support/Reason:

Converge/Diverge: **diverges**
Sum, if applicable:

2. \[ \sum_{n=0}^{\infty} 3 \left( -\frac{2}{3} \right)^n \]

Test Name: **geometric**
Apply Test:
\[
\Gamma = -\frac{2}{3}
\]
\[ 0 < \left| -\frac{2}{3} \right| < 1 \]
converges
\[
S = \frac{3}{1 - \left( -\frac{2}{3} \right)} = \frac{3}{\frac{5}{3}} = \frac{9}{5}
\]

Support/Reason:

Converge/Diverge: **converge**
Sum, if applicable: \[ S = \frac{9}{5} \]
3. \[ \sum_{n=1}^{\infty} (-1)^n \frac{1}{n+1} \]

Test Name: AST

Apply Test:

\[ a_n = \frac{1}{n+1} \]

\[ a_{n+1} = \frac{1}{n+2} \]

1) \[ \lim_{n \to \infty} a_n = \lim_{n \to \infty} \frac{1}{n+1} = 0 \]

2) \[ a_{n+1} \leq a_n \]

\[ \frac{1}{n+2} \leq \frac{1}{n+1} \]

Support/Reason:

Converge/Diverge: Converges

Sum, if applicable:

4. \[ \sum_{n=0}^{\infty} \frac{5^n}{(n+1)!} \]

Test Name: RATIO

Apply Test:

\[ a_n = \frac{5^n}{(n+1)!} \]

\[ a_{n+1} = \frac{5^{n+1}}{(n+2)!} \]

\[ \lim_{n \to \infty} \left| \frac{a_{n+1}}{a_n} \right| = \lim_{n \to \infty} \left| \frac{5^{n+1}}{(n+2)!} \cdot \frac{(n+1)!}{5^n} \right| \]

\[ = \lim_{n \to \infty} \left| \frac{5}{n+2} \right| = 0 < 1 \]

Support/Reason:

Converge/Diverge: Converges

Sum, if applicable: