1. Please circle True or False, as appropriate.

(a) T / F: In the Ratio Test, if \( \lim_{n \to \infty} \left| \frac{a_{n+1}}{a_n} \right| \geq 1 \), the series \( \sum a_n \) diverges.

(b) T / F: \( \sum a_n x^n \), if \( \lim_{n \to \infty} \left| \frac{a_{n+1}x^{n+1}}{a_n x^n} \right| = 5|x| \), the radius of convergence \( R \) is 1/5.

(c) T / F: \( \sum a_n (x - c)^n \), if \( \lim_{n \to \infty} \left| \frac{a_{n+1}}{a_n} \right| = \infty \), the radius of convergence is 0.

(d) T / F: \( \sum a_n (x - 1)^n \) converges when \( x = 0 \), it must converge when \( x = 2 \).

2. For each of the following series, circle if they converge or diverge and circle the test you used. (No justification required.)

\[ \sum_{n=1}^{\infty} \left( \frac{-2}{n} \right)^n \]
- converges
- diverges
- Divergence test
- Integral Test
- Root Test

\[ \sum_{n=1}^{\infty} (-1)^n \cos \frac{1}{n} \]
- converges
- diverges
- Divergence test
- Alternating Series Test
- Ratio Test

\[ \sum_{n=1}^{\infty} \frac{n}{2n^2 + 1} \]
- converges
- diverges
- Ratio Test
- Limit Comparison Test
- Divergence Test

CONTINUED ON REVERSE.
3. For the power series below, find and clearly state the radius and interval of convergence. Justification required: identify the tests you use, verify assumptions, and write conclusions.

\[ \sum_{n=1}^{\infty} \frac{(-1)^n (x - 5)^n}{n \cdot 3^n} \]

\[ \sqrt[n]{\frac{(-1)^n (x - 5)^n}{n \cdot 3^n}} = \frac{|x - 5|}{\sqrt{n}} \cdot \frac{1}{3} \xrightarrow{n \to \infty} \frac{|x - 5|}{3} < 1 \]

\[ \sum \quad |x - 5| < 3 \]

The radius of convergence is \( R = 3 \).

---

\[ x = 2 : \sum_{n=1}^{\infty} \frac{(-1)^n (-3)^n}{n \cdot 3^n} = \sum_{n=1}^{\infty} \frac{1}{n} \quad \text{which is the divergent Harmonic series.} \]

\[ x = 8 : \sum_{n=1}^{\infty} \frac{(-1)^n 3^n}{n \cdot 3^n} = \sum_{n=1}^{\infty} \frac{(-1)^n}{n} \quad \text{which is the convergent alternating Harmonic series.} \]

The interval of convergence is \( I = (2, 8] \).