1. [2] Please circle True or False, as appropriate.

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

(b) \( \square \) 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) \( \square \) 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. [3] For each of the following series, circle if they converge or diverge and circle the test you used. (No justification required.)

\[
\sum_{n=1}^{\infty} \left( \frac{-2}{n} \right)^n \\
\sum_{n=1}^{\infty} (-1)^n \cos \frac{1}{n} \\
\sum_{n=1}^{\infty} \frac{n}{2n^2 + 1}
\]

- converges
- diverges

Divergence test
Integral Test
Root Test
Divergence test
Alternating Series Test
Ratio Test
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.

\[ \sum_{n=1}^{\infty} \frac{(-1)^n (x-5)^n}{n 2^n} \]

\[ \sqrt[n]{\left| \frac{(-1)^n (x-5)^n}{n 2^n} \right|} \rightarrow \frac{|x-5|}{2^n} < 1 \text{ when } |x-5| < 2 \]

Radius

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

\[ x = 7 : \sum_{n=1}^{\infty} \frac{(-1)^n 2^n}{n 2^n} = \sum_{n=1}^{\infty} \frac{(-1)^n}{n} \text{ which converges by the Alternating Series Test since} \]

\[ \frac{1}{n} \rightarrow 0, \frac{1}{n^2} \rightarrow 0, \text{ and } \frac{1}{n} \rightarrow 0 \text{.} \]

So the interval of convergence is \( I = (3, 7] \).