Determine whether the sequence is convergent or divergent. If it converges, find the limit.

1. \( a_n = (-2)^n 3^{-n} \)
   
   Convergent \( L = 0 \)

2. \( a_n = \frac{\sin(1/n)}{1/n} \) (Use L’Hospital’s rule)
   
   Convergent \( L = 1 \)

3. \( a_n = \frac{2 \cdot 3^n - 4 + 5 \cdot 6^n + 7^n}{6^n} \)
   
   Divergent

4. Consider the sequence \( a_n = \frac{1}{2n+1} \).
   
   Show that this sequence is decreasing.
   \[ \frac{1}{2(n+1)+1} > \frac{1}{2n+1} \]
   
   Show that this sequence is bounded.
   \[ 0 < \frac{1}{2n+1} < 1 \]

5. Using a calculator, compute the first eight partial sums (up to four decimal places). Does the series appear to be convergent or divergent?
   
   \[ \sum_{n=1}^{\infty} \frac{1}{n^4 + n^2} \]
   
   Convergent.
   \[ s_1 = .5, s_2 = .55, s_3 = .5611, s_4 = .5648, s_5 = .5663, s_6 = .5671, s_7 = .5675, s_8 = .5677 \]

6. Using a calculator, compute the first eight partial sums (up to four decimal places). Does the series appear to be convergent or divergent?
   
   \[ \sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} \]
   
   Divergent.
   \[ S_1 = 1, s_2 = 1.7937, s_3 = 2.4871, s_4 = 3.1170, s_5 = 3.7018, s_6 = 4.2522, s_7 = 4.7749, s_8 = 5.2749 \]

Write the formula for the sum of a geometric series. For what values of \( r \) does it converge?

\[ \sum_{n=1}^{\infty} ar^{n-1} = \frac{a}{1 - r} \]

Determine whether the series is convergent or divergent. If it is convergent, find the sum.
7. \( \sum_{n=1}^{\infty} \left( \frac{4}{7} \right)^{n-1} \)
   Convergent. \( S = \frac{7}{3} \)

8. \( \sum_{n=1}^{\infty} 5 \cdot 3^{2n} \cdot 10^{1-n} \)
   Convergent. \( S = 450 \)

9. \( \sum_{n=1}^{\infty} e^{-n} \cdot 3^n \)
   Divergent.

10. \( \sum_{n=1}^{\infty} \frac{4 \cdot 3^n + 2 \cdot 5^n}{7^n} \)
    Convergent. \( S = 8 \)

11. \( \sum_{n=1}^{\infty} \frac{2n^2}{n^2 + n + 1} \)  \( \text{(Remember the test for divergence)} \)
    Divergent