Think It Through
October 12

1. Consider the geometric series $\sum_{n=1}^{\infty} ar^{n-1}$. For what values of r does the series converge?

2. For each of the following series determine if they converge to a finite number. If they do converge determine the number.

   (a) $\sum_{n=1}^{\infty} 3^n$

   (b) $\sum_{n=1}^{\infty} \left(\frac{1}{3}\right)^n$

   (c) $\sum_{n=1}^{\infty} 5\left(\frac{1}{5}\right)^{n-1}$

   (d) $\sum_{n=1}^{\infty} (-1)^n$

3. Determine the value of

$$\sum_{n=1}^{\infty} \left(2^{n+1} - 1\right)\left(\frac{1}{9}\right)^n$$

4. Determine the value of

$$\sum_{n=1}^{\infty} 63^{n-1} \left(\frac{1}{8}\right)^{2n}$$

5. Determine the value of

$$\sum_{n=1}^{\infty} \left(\frac{1}{2}\right)^{n} \left(\frac{5}{4}\right)^{2n}$$

6. Determine the the value of

$$\sum_{n=1}^{\infty} \left(3^{n+1} - 1\right) \left(\frac{1}{8}\right)^{n}$$

7. Determine values of x so that the following series converges

$$\sum_{n=1}^{\infty} \frac{2^n}{x^n}$$

8. ★ Show that the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n}$ is divergent.