

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

**Solution:** Series is divergent

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

**Solution:** Converges to 1.5

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

**Solution:** Converges to  $\frac{125}{4}$

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

**Solution:** Series is divergent

3. Determine the value of

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

**Solution:**  $\frac{81}{56}$

4. Determine the value of

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

**Solution:** 1

5. Determine the value of

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

**Solution:**  $\frac{25}{7}$

6. Determine the value of

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

**Solution:**  $\frac{128}{35}$

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

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

**Solution:**  $|x| > 2$

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