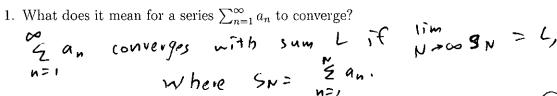
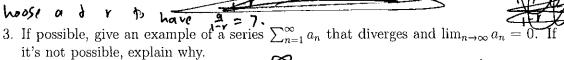
## Infinite Series Practice

## Definitions and Theory



Give an example of an infinite series that converges to 7.



4. If possible, give an example of a series  $\sum_{n=1}^{\infty} a_n$  that converges and  $\lim_{n\to\infty} a_n = 0$ . If it's not possible, explain why.

5. If possible, give an example of a series  $\sum_{n=1}^{\infty} a_n$  that diverges and  $\lim_{n\to\infty} a_n = 0$ . If it's not possible, explain why.

6. If possible, give an example of a series  $\sum_{n=1}^{\infty} a_n$  that converges and  $\lim_{n\to\infty} a_n \neq 0$ . If it's not possible, explain why.

7. Give the argument for why  $\sum_{n=1}^{\infty} ar^{n-1}$  converges when |r| < 1.

e argument for why 
$$\sum_{n=1}^{\infty} ar^{n-1}$$
 converges when  $|r| < 1$ .

$$S \mu = \alpha + ar + ar^{2} + \dots + ar^{n-1} + ar^{n}$$

$$- (r S \mu = \alpha + ar^{2} + \dots + ar^{n-1} + ar^{n})$$

$$S \mu = \alpha - ar^{n}$$

Series Convergence

8. Use the tools we looked at in class to determine the convergence or divergence of each of the following series. If a series converges, find its sum.

(a) 
$$\sum_{n=1}^{\infty} 2(-\frac{1}{3})^{n-1}$$
 converges (geo,  $r = -\frac{1}{3}$ ,  $|r| \ge 1$ ).  
Sum =  $\frac{a}{1-r} = \frac{2}{1-(-\frac{1}{3})} = \frac{2}{4/3} = \frac{2}{4} = \frac{3}{5}$ 

(b) 
$$\sum_{n=1}^{\infty} \frac{1}{3^{n-1}} = \frac{2}{5} \frac{1}{3^{n-1}} = \frac{1}{2/3} = \frac{1}{3} \frac{1}{3^{n-1}} = \frac{1}{2/3} = \frac{1}{3}$$

(c) 
$$\sum_{n=1}^{\infty} 3(-2)^{n-1}$$
 diverges ( geo,  $r = -3$ ,  $|1| 71$ ).

(d) 
$$\sum_{n=2}^{\infty} 7(-\frac{1}{2})^{n+3}$$
  $0$  converges (geo,  $r = -\frac{1}{3}$ ,  $|v| \ge 1$ ).

Shifted  $\frac{1}{9}$   $\frac{1}{1-(-\frac{1}{3})}$   $\frac{1}{1-(-\frac{1}{3})}$   $\frac{1}{1-(-\frac{1}{3})}$   $\frac{1}{1-(-\frac{1}{3})}$   $\frac{1}{1-(-\frac{1}{3})}$ 

(e) 
$$\sum_{n=1}^{\infty} \frac{2}{5^n} = \frac{\infty}{2} 2 (\frac{1}{5}^n) = \frac{\infty}{2} 2 (\frac{1}{5}^n)$$
 converges  $n=1$  (geo,  $v=\frac{1}{5}$ ).

Sum =  $\frac{1}{1-v} = \frac{2(\frac{1}{5})}{1-\frac{1}{5}} = \frac{1}{3}$ 

(f)  $\sum_{n=1}^{\infty} \frac{3^{2n}}{9^{n-1}} = \frac{\infty}{n=1} \frac{(3^2)^n}{9^{n-1}} = \frac{\infty}{n=1} \frac{9^n}{9^{n-1}} = \frac{\infty}{n=1} \frac{9}{9^{n-1}} = \frac{\infty}{n=1} \frac{9}{9^{n-1}}$ 

$$= 9+9+9+\dots = \infty$$

$$\text{diverges.}$$
A iso  $n \neq \infty$   $9 = 9 \neq 0$ ,

so diverges by Test for Divergence.