



Find each limit, or state that the limit does not exist and explain your reasoning.

10.  $\lim_{n \rightarrow \infty} \frac{3n}{4n+1} \div n$

$$\frac{3}{4 + \frac{1}{n}} = \boxed{\frac{3}{4}}$$

11.  $\lim_{n \rightarrow \infty} \frac{6n-3}{n} \div n$

$$\frac{6 - \frac{3}{n}}{1} = \boxed{6}$$

12.  $\lim_{n \rightarrow \infty} \frac{2^n n^3}{3n^3}$

$$\lim_{n \rightarrow \infty} 2^n \cdot \lim_{n \rightarrow \infty} \frac{n^3}{3n^3} \div n^3$$

DNE  $\cdot \frac{1}{3}$  **no limit**

13.  $\lim_{n \rightarrow \infty} \frac{4n^3-3n}{n^4-4n^3} \div n^4$

$$\frac{\frac{4}{n} - \frac{3}{n^3}}{1 - \frac{4}{n}} = \frac{0}{1}$$

$\boxed{0}$

14.  $\lim_{n \rightarrow \infty} \frac{n^3+3}{3n^2+1} \div n^3$

$$\frac{1 + \frac{3}{n^3}}{\frac{3}{n} + \frac{1}{n^2}} = \frac{1}{0}$$

**no limit**

15.  $\lim_{n \rightarrow \infty} \frac{n^3-n^2+4}{5+2n^3} \div n^3$

$$\frac{1 - \frac{1}{n} + \frac{4}{n^3}}{\frac{5}{n^3} + 2} = \boxed{\frac{1}{2}}$$

16. Find the sum of the infinite series  $1260 + 504 + 201.6 + 80.64 + \dots$

$$S = \frac{a_1}{1-r}$$

$$r = \frac{504}{1260} = 0.4$$

$$S = \frac{1260}{1-0.4} = \boxed{2100}$$

$$|r| < 1$$

Write each sum in expanded form and then find the sum.

17.  $\sum_{a=5}^9 (3a-3)$

18.  $\sum_{k=1}^{\infty} (0.4)^k$

$$a_1 = (0.4)^1 = 0.4 \quad r = \frac{0.16}{0.4} = 0.4$$

$$a_2 = (0.4)^2 = 0.16$$

$n=5 \quad n=6 \quad n=7 \quad n=8 \quad n=9$

$$(3(5)-3) + (3(6)-3) + (3(7)-3) + (3(8)-3) + (3(9)-3)$$

$$12 + 15 + 18 + 21 + 24 = \boxed{90}$$

$$S = \frac{0.4}{1-0.4} = \boxed{\frac{2}{3} = 0.67}$$

Express each series using sigma notation.

19.  $-27 + 9 - 3 + 1 - \dots$

$$\sum_{n=3}^{\infty} 3^{6-n} (-1)^n$$

20.  $\frac{3 \cdot 9}{10} + \frac{3 \cdot 11}{12} + \frac{3 \cdot 13}{14} + \dots + \frac{3 \cdot 23}{24}$

$$\sum_{n=4}^{11} \frac{3 \cdot (2n+1)}{2n+2}$$

$$\frac{3 \cdot 2n+1}{2n+2}$$

21.  $-1 + 1 + 3 + 5 \dots$

$$\sum_{n=1}^{\infty} 2n-3$$

22.  $2 + 5 + 10 + 17 + \dots + 82$

$$\sum_{n=1}^9 n^2 + 1$$

$$2n+1=23$$

$$2n=22$$

$$n=11$$

23.  $5 + 10 + 15 + \dots + 95$

$$\sum_{n=1}^{19} 5n$$

24.  $1 + 2 + 6 + 24 + \dots$

$$\sum_{n=1}^{\infty} n!$$

25.  $5 + 5 + \frac{5}{2} + \frac{5}{6} + \frac{5}{24} + \dots + \frac{5}{5040}$

$$\sum_{n=0}^7 \frac{5}{n!}$$

26.  $\frac{3}{9 \cdot 2} + \frac{8}{27 \cdot 6} + \frac{15}{81 \cdot 24} + \dots$

$$\sum_{n=2}^{\infty} \frac{n-1}{3^n n!}$$