For each of exercises 1–4, write the formula a_n that models each sequence, starting at $n = 1$.

1. $\{1, 3, 5, 7, \ldots\}$

2. $\left\{\frac{2}{3}, -\frac{3}{4}, \frac{4}{5}, -\frac{5}{6}, \ldots\right\}$

3. $\{2, 6, 18, 54, \ldots\}$

4. $\left\{\frac{2}{3}, -\frac{4}{4}, \frac{8}{5}, -\frac{16}{6}, \ldots\right\}$

For each of exercises 5–10, find the value to which the sequence converges or show that it diverges.

5. $a_n = \dfrac{n-2}{n+5}$

6. $b_n = \dfrac{n^2+4n-8}{3n^4+5}$

7. $a_n = \dfrac{n^3-8n^2+12n-5}{9n^2+5n-12}$

8. $\{-2, 2, -2, 2, \ldots\}$

9. $\left\{\frac{3}{4}, \frac{9}{16}, \frac{27}{64}, \frac{81}{256}, \ldots\right\}$

10. $\{0, -3, -6, -9, \ldots\}$

For each of exercises 11–16, determine whether or not the divergence test establishes divergence for the series.

11. $\displaystyle\sum_{n=2}^{\infty} \frac{2n^2}{5n^2+11n-7}$

12. $\displaystyle\sum_{n=0}^{\infty} \cos(n)$

13. $\displaystyle\sum_{n=1}^{\infty} e^n \cdot 3^{-n}$

14. $2 + \frac{1}{2} + \frac{1}{8} + \frac{1}{32} + \cdots$

15. $3 - 3 + 3 - 3 + 3 + \cdots$

16. $\displaystyle\sum_{n=10}^{\infty} \frac{n!}{n^{170870} - 2}$

17. Consider the family of sums $\sum_{n=1}^{\infty} a_n + \sum_{n=1}^{\infty} b_n$.

a. Find formulas for a_n and b_n such that $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$ both diverge and $\sum_{n=1}^{\infty} a_n + \sum_{n=1}^{\infty} b_n$ diverges.

b. Find formulas for a_n and b_n such that $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$ both diverge and $\sum_{n=1}^{\infty} a_n + \sum_{n=1}^{\infty} b_n$ converges.

18. Determine whether the following statement is true or false: If $\{a_n\}$ converges, then so does $\sum a_n$.

19. Determine whether the following statement is true or false: If $\{a_n\}$ diverges, then so does $\sum a_n$.