Determine whether the sequence converges or diverges. If it converges, find the limit.

1. $\left\{\dfrac{\ln n}{n}\right\}$

2. $\{\cos(2\pi n)\}$

3. $\left\{\ln\left(\dfrac{1}{n}\right)\right\}$

4. $\left\{2^{\frac{1}{n}}\right\}$

5. $\left\{\dfrac{(n+1)!}{n!}\right\}$

6. $\left\{(-1)^{2n}\right\}$

7. $\left\{\left(\dfrac{2}{3}\right)^{n}\right\}$

8. $\left\{\displaystyle\int_{1}^{n}\dfrac{1}{x^2}\,dx\right\}$

9. For each of the sequences below determine the next two terms.

   (a) $1, 2, 4, 8, 16, \ldots$
   (b) $1, 3, 5, 7, 9, \ldots$
   (c) $\frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \ldots$
   (d) $\frac{1}{2}, \frac{2}{4}, \frac{6}{8}, \frac{24}{16}, \frac{120}{32}, \ldots$

10. For each of the sequences below determine the nth term.

   (a) $1, 2, 4, 8, 16, \ldots$
   (b) $1, 3, 5, 7, 9, \ldots$
   (c) $\frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \ldots$
   (d) $\frac{1}{2}, \frac{2}{4}, \frac{6}{8}, \frac{24}{16}, \frac{120}{32}, \ldots$