6. \( \left\{ 1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \frac{1}{81}, \ldots \right\} \). The denominator of the \( n \)th term is the \((n - 1)\)st power of 3, so \( a_n = \frac{1}{3^{n-1}} \).
22. \( a_n = \cos(2/n) \). As \( n \to \infty \), \( 2/n \to 0 \), so \( \cos(2/n) \to \cos 0 = 1 \) because \( \cos \) is continuous. Converges
32. \( \lim_{x \to \infty} \frac{(\ln x)^2}{x} \stackrel{H}{=} \lim_{x \to \infty} \frac{2(\ln x)(1/x)}{1} = 2 \lim_{x \to \infty} \frac{\ln x}{x} \stackrel{H}{=} 2 \lim_{x \to \infty} \frac{1/x}{1} = 0 \), so by Theorem 3, \( \lim_{n \to \infty} \frac{(\ln n)^2}{n} = 0 \). Convergent
50. \( a_n = \frac{2n - 3}{3n + 4} \) defines an increasing sequence since for \( f(x) = \frac{2x - 3}{3x + 4} \),

\[
f'(x) = \frac{(3x + 4)(2) - (2x - 3)(3)}{(3x + 4)^2} = \frac{17}{(3x + 4)^2} > 0.
\]
The sequence is bounded since \( a_n \geq a_1 = -\frac{1}{7} \) for \( n \geq 1 \),

and \( a_n < \frac{2n - 3}{3n} < \frac{2n}{3n} = \frac{2}{3} \) for \( n \geq 1 \).
14. $1 + 0.4 + 0.16 + 0.064 + \cdots$ is a geometric series with ratio $r = 0.4 = \frac{2}{5}$. Since $|r| = \frac{2}{5} < 1$, the series converges to

$$\frac{a}{1-r} = \frac{1}{1 - 2/5} = \frac{5}{3}.$$
22. \[ \sum_{n=1}^{\infty} \cos \frac{1}{n} \] diverges by the Test for Divergence since \[ \lim_{n \to \infty} a_n = \lim_{n \to \infty} \cos \frac{1}{n} = \cos 0 = 1 \neq 0. \]