1. Evaluate each integral or show that it diverges.
   a. \( \int_0^3 \frac{1}{(x - 3)^2} \, dx \)
   b. \( \int_0^\infty e^{-(2x+1)} \, dx \)
c. \[ \int_{-2}^{0} \frac{dx}{\sqrt{x+2}} \]

d. \[ \int_{2}^{\infty} \frac{1}{x(\ln x)^{2/3}} \, dx \]
2. Evaluate each limit (write ∞ or −∞ where appropriate.)

a. \[ \lim_{x \to 0} \frac{\sin(x) - x}{x^3} \]

b. \[ \lim_{x \to \infty} x \sin(1/x) \]

c. \[ \lim_{x \to 0^+} x \ln x \]

d. \[ \lim_{x \to \infty} (\ln x - x) \]
3. Determine whether the sequence converges or diverges. If it converges, find the limit.
   a. \( a_n = \sqrt{n + 3} - \sqrt{n} \)

   b. \( a_n = (1 + 3n)^{1/n} \)

   c. \( a_n = \frac{\cos^2 n}{n^3} \)
4. Determine whether the series is convergent or divergent. If it is convergent, find its sum.

a. \[ \sum_{n=0}^{\infty} \frac{4^{n+1}}{5^n} \]

b. \[ \sum_{n=1}^{\infty} \frac{4+3^n}{2^n} \]

5. The series \[ \sum_{k=0}^{\infty} \frac{x^k}{3^k} \] converges only for

   a. \(-1 < x < 1\)
   b. all \(x\)
   c. \(x = 3\)
   d. \(-3 < x < 3\)
   e. None of these