

Problem 1: Determine if the following series converge or diverge. Be as specific as possible with your conclusion.

(a)
$$\sum_{n=0}^{\infty} \frac{1}{n!}$$

(b)
$$\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$$

(c)
$$\sum_{n=0}^{\infty} \frac{n}{3^n}$$

(d)
$$\sum_{n=2}^{\infty} \frac{n}{(\ln n)^n}$$

(e)
$$\sum_{n=0}^{\infty} \frac{e^n}{n!}$$

(f)
$$\sum_{n=0}^{\infty} \frac{4^n}{5^{n+2}}$$

(g)
$$\sum_{n=1}^{\infty} \frac{4^n}{(n+1)^n}$$

(h)
$$\sum_{n=1}^{\infty} \frac{n^n}{2^{n^2}}$$

(i)
$$\sum_{n=0}^{\infty} \frac{n^6}{(2n)!}$$

(j)
$$\sum_{n=1}^{\infty} \left(1 + \frac{1}{n}\right)^n$$

(k)
$$\sum_{n=1}^{\infty} \frac{(-1)^n n!}{1 \cdot 3 \cdot 5 \cdots (2n+1)}$$

(l)
$$\sum_{n=1}^{\infty} \frac{n!}{n^n}$$

(m)
$$\sum_{n=1}^{\infty} \frac{3e^n}{2^{4n+1}}$$

(n)
$$\sum_{n=0}^{\infty} n \left(\frac{3}{5}\right)^{n-1}$$

(o)
$$\sum_{n=1}^{\infty} \left(\frac{1}{n} - \frac{1}{n^2}\right)^n$$

(p)
$$\sum_{n=0}^{\infty} \frac{(2n)!}{2^n n!}$$

(q)
$$\sum_{n=1}^{\infty} \frac{n^2 + 2n + 1}{2^n + 5}$$

Problem 2: Determine if the following series converge or diverge. Be as specific as possible with your conclusion.

$$(a) \sum_{n=0}^{\infty} \frac{1}{8^n}$$

$$(b) \sum_{n=1}^{\infty} \frac{2^n}{n^5}$$

$$(c) \sum_{n=0}^{\infty} \frac{2^{2n} 5^n}{11^n}$$

$$(d) \sum_{n=0}^{\infty} \frac{3^n}{2n^2 + 1}$$

$$(e) \sum_{n=1}^{\infty} \left(\frac{n+5}{5n} \right)^n$$

$$(f) \sum_{n=1}^{\infty} (\arctan n)^n$$

$$(g) \sum_{n=0}^{\infty} (-1)^n \frac{n+1}{2^n}$$

$$(h) \sum_{n=1}^{\infty} \frac{1}{n^n}$$

$$(i) \sum_{n=0}^{\infty} \frac{n^2}{e^n}$$

$$(j) \sum_{n=1}^{\infty} \frac{n6^n}{n!}$$

$$(k) \sum_{n=1}^{\infty} \frac{e^n \ln n}{3^n n^2}$$

$$(l) \sum_{n=1}^{\infty} \frac{n^n}{n!}$$

$$(m) \sum_{n=1}^{\infty} \frac{5^n}{(n-1)!}$$

$$(n) \sum_{n=1}^{\infty} \left(\frac{1}{n} - e^{-n^2} \right)$$

$$(o) \sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!}$$

$$(p) \sum_{n=1}^{\infty} \left(1 - \frac{1}{n} \right)^{n^2}$$

$$(q) \sum_{n=1}^{\infty} \frac{(2n+1)!}{4^n (n!)^2}$$

$$(r) \sum_{n=0}^{\infty} \arctan e^{-n}$$

$$(s) \sum_{n=0}^{\infty} \frac{(n!)^3}{(3n)!}$$