

**Section 10.5: Absolute Convergence, Ratio & Root Tests - Worksheet**

1. Determine if the series below converge or diverge. Make sure to clearly label and justify the use of any convergence test used. **Note:** some of these problems require convergence tests from previous sections.

(a)  $\sum_{n=1}^{\infty} (-1)^n \frac{n^n}{3^{2n}}$

(d)  $\sum_{n=1}^{\infty} \frac{\cos(8n) + 3}{4^n}$

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

(b)  $\sum_{n=1}^{\infty} \frac{\sqrt[3]{8n^6 + 7n + 11}}{3n^7 + 8n^5 - 1}$

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

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

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

(f)  $\sum_{n=1}^{\infty} 4^n \left(\frac{n-2}{n}\right)^{n^2}$

(i)  $\sum_{n=1}^{\infty} \left(\frac{2n+5\sin(n)}{3n}\right)^n$

2. Let  $a_n$  be the sequence defined recursively by

$$a_1 = 7, \quad a_{n+1} = a_n \left(\frac{n}{n+3}\right)^n \quad \text{for } n \geq 1.$$

Determine whether the series  $\sum_{n=1}^{\infty} a_n$  converges or diverges. Make sure to clearly label and justify the use of any convergence test used.