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

#71. 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) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{n^e}$

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

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

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

(e) $\displaystyle\sum_{n=1}^{\infty} \frac{\cos(8n)+6}{4^n}$

(f) $\displaystyle\sum_{n=1}^{\infty} \frac{8\cos(n)+6}{4^n}$

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

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

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

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

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

(l) $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^n}{n\ln(4n)^5}$

#72. Let a_n be the sequence defined recursively by

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

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