Series Worksheet : Make sure you state the relevant results and justify all of your steps.

1. Find the EXACT sum:

(a) $\displaystyle\sum_{n=1}^{300} \left[6\cdot\left(\frac{3}{5}\right)^{n}\right]$ (b) $\displaystyle\sum_{n=25}^{\infty} \left[7\cdot\left(\frac{1}{4}\right)^{n}\right]$ (c) $1-\frac{1}{3}+\frac{1}{9}-\frac{1}{27}+\frac{1}{81}\ldots$

(d) $\displaystyle\sum_{n=0}^{\infty} \left(11\cdot\frac{2^{n+3}}{9^{n+2}}\right)$ (e) $\displaystyle\sum_{n=0}^{\infty} e^{-\pi n}$

2. Use a convergence test to determine if the series converge or diverge. Do not conflate the various tests and their conclusions. Make sure you use proper logic, inequalities, and quote any and all relevant results/convergent tests.

(a) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{4n^2+7n^3}{8n+10n^5}\right)$ (b) $\displaystyle\sum_{n=1}^{\infty} \left(2+\frac{3}{n}\right)^{n}$ (c) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n\cdot\ln(n)}$

(d) $\displaystyle\sum_{n=0}^{\infty} \frac{n!}{6^n}$ (e) $\displaystyle\sum_{n=1}^{\infty} \left[(-1)^{n+1}\cdot\frac{n}{n^2+3}\right]$ (f) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{2+\sqrt{n}}{n+10}\right)$

(g) $\displaystyle\sum_{n=2}^{\infty} \left[(-1)^{n+1}\cdot\frac{3}{\ln(n)}\right]$ (h) $\displaystyle\sum_{n=1}^{10000000} \left(n^2+3n\right)$ (i) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{7+2n}{12+5n}\right)$

(j) $\displaystyle\sum_{n=1}^{\infty} \frac{n^n}{n!}$ (k) $\displaystyle\sum_{n=1}^{\infty} \sin(n)$ (l) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{1}{n^2}+\frac{1}{n}+\frac{1}{n^4}\right)$

(m) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{8+4n^2}{n+n^2}\right)^{n}$ (n) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{1}{n}-\frac{1}{n+1}\right)$ (o) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{\ln(n)}$

(p) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{1}{2n+3}\right)^{n}$ (q) $\displaystyle\sum_{n=1}^{\infty} \frac{(n+3)!}{n!}$ (r) $\displaystyle\sum_{n=1}^{\infty} \left(1-\frac{4}{n+5}\right)$

(s) $\displaystyle\sum_{n=0}^{\infty} \left(\frac{1}{n^2+8^n}\right)$ (t) $\displaystyle\sum_{n=1}^{\infty} \left(n^3\cdot e^{-n^4}\right)$ (u) $\displaystyle\sum_{n=1}^{\infty} \frac{3^n}{(n+2)!}$

(v) $\displaystyle\sum_{n=1}^{\infty} n$ (w) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{n+5n^7}{n^{10}}\right)$ (x) $\displaystyle\sum_{n=1}^{\infty} \ln\left(2+\frac{3}{n}\right)$