1. Determine the convergence/divergence of the following series (mostly RaT):

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

(b) $\sum_{n=1}^{\infty} \frac{n!}{10^n}$

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

(d) $\sum_{n=1}^{\infty} \frac{5^n}{(n+1)4^{2n+1}}$

(e) $\sum_{n=1}^{\infty} ne^{-n}$

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

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

(h) $\sum_{n=1}^{\infty} \frac{n^4 4^n}{n!}$

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

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

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

(l) $\sum_{n=1}^{\infty} \frac{1\cdot 3\cdot 5\ldots(2n-1)}{n!}$

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

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

2. Determine the convergence/divergence of the following series (lots of mixed problems):

(a) $\sum_{n=1}^{\infty} \frac{n^6}{6^n}$

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

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

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

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

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

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

(h) $\sum_{n=1}^{\infty} \frac{n^4}{n^6+3}$

(i) $\sum_{n=14}^{\infty} \frac{n6^n}{(n+1)!}$

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

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

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

(m) $\sum_{n=1}^{\infty} \frac{1}{1+\sqrt{n}}$

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

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

(p) $\sum_{n=1}^{\infty} \frac{n+2}{n^3+7n-1}$

(q) $\sum_{n=1}^{\infty} \frac{16^n}{n^{120}}$

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

(s) $\sum_{n=1}^{\infty} \frac{6+7^n}{9+7^n}$

(t) $\sum_{n=1}^{\infty} \frac{1}{6+\sqrt[4]{n^6}}$

(u) $\sum_{n=1}^{\infty} \frac{\sqrt{3n}}{(1+\sqrt{n})^5}$

(v) $\sum_{n=1}^{\infty} \frac{n^2+6n}{n^7+2}$

(w) $\sum_{n=1}^{\infty} \frac{n^{3/2}}{5n^2-1}$

(x) $\sum_{n=1}^{\infty} \left(\sqrt{n+1}-\sqrt{n}\right)$

(y) $\sum_{n=1}^{\infty} \frac{1}{n^{1+1/n}}$

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

3. Determine the convergence/divergence of the following series (challenging):

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

(b) $\sum_{n=1}^{\infty} \frac{\ln(n)}{n^3}$

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

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