Problem 1: Determine, with proof, the convergence/divergence of the following series:

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

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

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

(d) $\displaystyle\sum_{n=1}^{\infty} \frac{n^2-1}{3n^4+5}$

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

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

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

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

(i) $\displaystyle\sum_{n=1}^{\infty} \frac{n\ln n}{n^4+5n+3}$

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

Problem 2: Determine, with proof, the convergence/divergence of the following series:

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

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

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

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

(e) $\displaystyle\sum_{n=1}^{\infty} e^{-n^2}$

(f) $\displaystyle\sum_{n=1}^{\infty} \frac{\ln n}{n+5}$

(g) $\displaystyle\sum_{n=1}^{\infty} \frac{n+3}{n^3-5n+4}$

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

Problem 3: Determine, with proof, the convergence/divergence of the following series:

(a) $\displaystyle\sum_{n=1}^{\infty} \sin\left(\frac{1}{n}\right)$

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

(c) $\displaystyle\sum_{n=1}^{\infty} \frac{6}{n+\sqrt{2n^2+5}}$

(d) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{3\sqrt[3]{n}-1}$

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

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

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

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

(i) $\displaystyle\sum_{n=1}^{\infty} \frac{2n - 5}{\sqrt{3n^6 - 2}}$

(j) $\displaystyle\sum_{n=1}^{\infty} \frac{7 + 4\sqrt[3]{n^4}}{n^2 + 2n + 1}$