1. (30 pts.) Determine whether the following series converge:

(a) \( \sum_{k=2}^{\infty} \frac{1}{k^{3/2} \log(k)} \)
(b) \( \sum_{k=1}^{\infty} \frac{(2k)!}{(k!)^2} \)
(c) \( \sum_{k=1}^{\infty} \left( \frac{k + 1}{k} \right)^{k^2} \)

2. (20 pts.) Find the interval of convergence of

\[ \sum_{k=1}^{\infty} \frac{\cos(\pi k)}{\sqrt{k}} (2x + 1)^k \]

3. (30 pts.) Find the second order Taylor approximation for \( \log(2 + x/2) \) at \(-2\). Estimate the absolute error on \([-3, -1]\).

4. (20 pts.) Find the first four nontrivial terms of the Maclaurin series for the following functions:

(a) \( f(x) = \frac{x^8}{(2 + x)^2} \)
(b) \( f(x) = x^5 (x + 1) e^{x^2} \)

Extra credit (5 pts.): What would they be for \( e^{x^2+1} \)?