Answer the problems on separate paper. You do not need to rewrite the problem statements on your answer sheets. Work carefully. Do your own work. Show all relevant supporting steps!

Bald solutions to problems – answers without accompanying, supporting work – will receive no credit.

For each problem choose 1 (one, uno, eins, un) of the two options.

1. (10 pts) Choose one. Find \( \frac{dy}{dx} \). Simplify where possible.
   a. \( y = \sinh(1 - \sqrt{x}) \)
   b. \( y = \tanh(x - \ln x) \)

2. (10 pts) Choose one. Find \( \frac{dy}{dx} \). Simplify where possible.
   a. \( y = \sinh^{-1} x^3 \)
   b. \( y = \tanh^{-1} (\sin x) \)

3. (10 pts) Choose one. Compute the limit of the sequence, where it exists. Show all supporting work.
   a. \( \left\{ \frac{1 - 5n^4}{n^4 + 8n^2} \right\} \)
   b. \( \left\{ \frac{\ln n}{\sqrt{n}} \right\} \)

4. (16 pts) Choose one. Determine whether the series converges or diverges. Show all supporting work.
   a. \( \sum_{k=2}^{\infty} \frac{1}{\sqrt{k^3 - 2}} \)
   b. \( \sum_{k=1}^{\infty} \frac{\sqrt{k}}{3k^2 + 2} \)

5. (16 pts) Choose one. Determine whether the series converges or diverges. Show all supporting work.
   a. \( \sum_{k=1}^{\infty} \frac{k^{10} 2^k}{k!} \)
   b. \( \sum_{k=1}^{\infty} \frac{k!}{10^k} \)

6. (16 pts) Choose one. Determine whether the series converges absolutely, converges conditionally or diverges. Show all supporting work.
   a. \( \sum_{k=1}^{\infty} (-1)^{k+1} \frac{k}{k^2 + 1} \)
   b. \( \sum_{k=1}^{\infty} (-1)^{k+1} \frac{k + 1}{k^2} \)

7. (16 pts) Choose one. Find the convergence set for the power series. Show all supporting work.
   a. \( \sum_{k=1}^{\infty} \frac{2^k x^k}{k^2} \)
   b. \( \sum_{k=1}^{\infty} \frac{x^k}{k 2^k} \)

8. (10 pts) Choose one. Determine how many terms of the series are necessary to estimate its sum to three-place accuracy. Using those terms, estimate the sum of the series.
   a. \( \sum_{k=1}^{\infty} \frac{(-1)^{k+1} k^2}{10^k} \)
   b. \( \sum_{k=1}^{\infty} \frac{(-1)^{k+1} k^2}{(2k)!} \)