

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. $\left\{ \frac{1-5n^4}{n^4+8n^5} \right\}$

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. $\sum_{k=1}^{\infty} (-1)^{k+1} \frac{k}{k^3+1}$

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. $\sum_{k=1}^{\infty} (-1)^{k+1} \frac{k^2}{10^k}$

b. $\sum_{k=1}^{\infty} (-1)^{k+1} \frac{k^2}{(2k)!}$