1. Find $f^{(152)(0)}$, the 152nd derivative for the function $f(x) = \sum_{n=0}^{\infty} \frac{(-1)^n x^n}{3^n(n+2)}$

2. Find the Taylor series expansion for the following functions
   (a) xe^{3x} centered at $x = 5$
   (b) $\ln(1+x)$ centered at $x = 2$

3. Find the Maclaurin series for $f(x)$.
   (a) $f(x) = x^2\cos(2x)$
   (b) $f(x) = xe^{-x^2}$
   (c) $f(x) = \sqrt[3]{8+x}$

4. Evaluate the integral
   (a) $\int 5x^2 \arctan(7x^3)\, dx$
   (b) $\int_0^x e^{-t^2}\, dt$

5. Find the sum of the following series
   (a) $f(x) = \sum_{n=2}^{\infty} \frac{(-1)^n 3^n \pi^n}{n!}$
   (b) $f(x) = \sum_{n=0}^{\infty} \frac{(-1)^n 3^{2n+1}}{(2n+1)!}$
   (c) $f(x) = \sum_{n=2}^{\infty} \frac{(-1)^n \pi^{2n}}{6^{2n}(2n)!}$

6. Find the third degree Taylor polynomial for $f(x) = \sqrt{x}$ at $x = 4$.

7. Find the second degree Taylor polynomial for $f(x) = \arctan(x)$ at $x = 1$.

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8. Find the radius and interval of convergence for the series $\sum_{n=1}^{\infty} \frac{3^n(x-5)^n}{n^2+1}$

9. If the power series $\sum_{n=0}^{\infty} c_n(x-2)^n$ converges at $x = 4$ and diverges at $x = -2$, which of the following series will also converge?
   (a) $\sum_{n=0}^{\infty} c_n(-1)^n 2^n$
   (b) $\sum_{n=0}^{\infty} c_n 7^n$
   (c) $\sum_{n=0}^{\infty} c_n(-1)^n 2^{-n}$

10. Find the power series representation for the function $f(x) = \dfrac{x^3}{(5-3x^2)^2}$

11. Which of the following series converge. State the test you have used.

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

   (b) $\displaystyle\sum_{n=0}^{\infty} \frac{1}{n^2+2n+4}$

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

   (d) $\displaystyle\sum_{n=0}^{\infty} \frac{1}{n!}$

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

12. Which of the following series converges absolutely?

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

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

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

13. How many terms is needed to approximate the sum of the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^5}$ within 2×10^{-9}?

14. Use the fifth partial sum to approximate the sum of the series $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n n^2}{(n+3)!}$. Find the upper bound for the error in the estimate.