

USING SERIES

Create a new series from an old series

1. Find the Taylor series for $g(x) = x^2 e^x$ about $x = 0$. Include the general term.
2. Find the Taylor series for $h(x) = \ln(4 + 8x)$ about $x = 0$. Include the interval of convergence.

Use a series to evaluate or approximate

3. Find the exact value of $1 + 2 + \frac{4}{2!} + \frac{8}{3!} + \frac{16}{4!} + \dots$.
4. Solve for x : $x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \dots = 1$
5. Find $f^{(5)}(0)$ and $f^{(6)}(0)$ for $f(x) = \arctan(x)$.
6. Estimate $\int_0^1 e^{-x^2} dx$.
7. Evaluate the limit $\lim_{x \rightarrow 0} \frac{x \cdot \arctan(x)}{e^{x^2} - 1}$.

Expand a function in a series

8. Expand $F = \frac{mgR^2}{(R+h)^2}$ in terms of $\frac{h}{R}$. Assume R is very large when compared to h .
9. Expand $Q = 2\pi\sigma(\sqrt{R^2 + a^2} - R)$ in terms of $\frac{a}{R}$. Assume R is very large when compared to a .
10. Find a formula for e^{it} where $i = \sqrt{-1}$.