

1. Consider $f(x) = \frac{1}{1-x}$. Find:

- (a) $f'(x)$ and $f'(0)$ (d) $f^{(4)}(x)$ and $f^{(4)}(0)$
(b) $f''(x)$ and $f''(0)$ (e) $f^{(n)}(x)$ and $f^{(n)}(0)$
(c) $f^{(3)}(x)$ and $f^{(3)}(0)$

2. Start a table of expressions for the first 4 non-zero terms of the Maclaurin series. for:

- (a) e^x (c) $\cos(x)$
(b) $\sin(x)$ (d) $f(x)$ [include a general n^{th} degree term]

3. (a) Demonstrate how to use Maclaurin series to evaluate $\lim_{x \rightarrow 0} \frac{x^2 e^x}{\cos x - 1}$

(b) Explain why using just the first few non-zero terms of the series is sufficient.

4. (a) Build the Maclaurin Series for $f(x) = \frac{1}{1-x}$.

(b) Use part (a) to find the Maclaurin Series for $g(x) = \frac{1}{1+x}$. [Hint: express g in terms of f .]

(c) Use part (b) to find the Maclaurin Series for $h(x) = \ln(1+x)$.

(d) For what values of x will the Series in part (a) converge? Explain

(e) How about for the series in part (b)?

5. Consider $w(x) = \frac{1}{1+x^2}$.

(a) What is the domain of w ?

(b) Find the Maclaurin Series for $w(x)$. [Hint: look at question 4.]

(c) What is the radius of convergence for this Maclaurin Series?