1. Consider $f(x) = \dfrac{1}{1-x}$. Find:
   (a) $f'(x)$ and $f'(0)$
   (b) $f''(x)$ and $f''(0)$
   (c) $f^{(3)}(x)$ and $f^{(3)}(0)$
   (d) $f^{(4)}(x)$ and $f^{(4)}(0)$
   (e) $f^{(n)}(x)$ and $f^{(n)}(0)$

2. List equations for the first 4 non-zero terms of the Maclaurin series for:
   (a) e^x
   (b) $\sin(x)$
   (c) $\cos(x)$

3. Determine whether each series converges or not. Explain. For any series which does converge, find the sum.
   (a) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{3^n}$
   (b) $\displaystyle\sum_{n=0}^{\infty} \frac{3^n}{8^{2n+1}}$
   (c) $\displaystyle\sum_{n=5}^{\infty} \frac{10^n}{11^n}$
   (d) $\displaystyle\sum_{n=1}^{\infty} \frac{3^n}{3^{n+4}}$

4. Demonstrate how to use a Maclaurin series to evaluate $\displaystyle\lim_{x\to 0} \frac{\sin x - x}{x^3}$.

5. (a) Build the Maclaurin Series for $f(x) = \dfrac{1}{1-x}$.
   (b) Use part (a) to find the Maclaurin Series for $g(x) = \dfrac{1}{1+x}$. [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)?

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