1. Using $f(x) = x^2 - 3$, find the first three approximations for $\sqrt{3}$ by Newton's method starting with $x_0 = 2$. How would you estimate $\sqrt[3]{4}$?

2. Compute the limit
$$\lim_{x\to\infty} \left(1 + \frac{1}{x}\right)^x$$

3. Compute the limit
$$\lim_{x\to 0} \frac{9x - 3\sin 3x}{5x^3}$$

4. In L'Hôpital's 1696 textbook, he illustrated his rule by finding the limit
$$\lim_{x\to a} \frac{\sqrt{2a^3x - x^4} - a\sqrt[3]{a^2x}}{a - \sqrt[4]{ax^3}}$$
where $a > 0$. Find this limit as well.

5. Find the fourth order Taylor approximation to $\ln x$ about $x = 1$. Use this to estimate $\ln 1.1$

6. Find the fourth order Taylor approximation to both $-\ln(1-x)$ and $1/(1-x)$ about $x = 0$, and show that you can find the series for $1/(1-x)$ by differentiating the series for $-\ln(1-x)$.

7. Evaluate the following sums
$$\sum_{i=1}^{5} \frac{1}{i} \qquad \sum_{i=0}^{5} 2^i \qquad \sum_{n=3}^{6} n!$$

8. Show that the sum of the binomial coefficients satisfy
$$\sum_{k=0}^{n} \binom{n}{k} = 2^n.$$
Hint: use the binomial theorem.