1 (15 pts.) Calculate the following limits. If they do not exist, state whether or not they are equal to $\infty$ or $-\infty$.

(a) $\lim_{t \to 0} \frac{\tan t^2}{t}$.

(b) $\lim_{x \to 0^+} \frac{\ln(x^2 + 2x)}{\ln x}$.

2 (10 pts.) Is it true that for every $x > 0$, the inequality $|\cos x - 1| \leq x$ holds? Why or why not? (Hint: consider the function $f(t) = \cos t$ on $[0, x]$, and think about the Mean Value Theorem.)
3 (25 pts.) What are the dimensions of the open-top cylindrical can with the smallest surface area that will hold 1000 cubic cm of liquid?
Let \( f(x) = e^x - 2e^{-x} - 3x \). Find the critical points, and the intervals on which \( f(x) \) is increasing and decreasing. Find the inflection points, and the intervals on which the graph is concave up and concave down. Sketch the graph of \( f(x) \).
5 (15 pts.) Find the local extrema of \( f(x) = \frac{6x - 10}{x^2 - 1} \), and state whether they are local maxima or local minima.

6 (10 pts.) Use Newton’s method to approximate \( \sqrt[3]{2} \). If \( x_0 = 1 \), what are \( x_1 \) and \( x_2 \)?