1. Precisely define \( \lim_{x \to \infty} f(x) = L \) using inequalities in terms of \( M \) and \( \epsilon \).

2. Use the limit definition and the facts that
\[
\lim_{\theta \to 0} \frac{\sin \theta}{\theta} = 1 \quad \text{and} \quad \lim_{\theta \to 0} \frac{1 - \cos \theta}{\theta} = 0
\]
to explain why the derivative of \( f(x) = \sin x \) is \( f'(x) = \cos x \).

3. Use the rules of calculus to find the following derivatives:
   
   (i) \( \frac{d}{dx} \arctan(x^2) \)
   
   (ii) \( \frac{d}{dx} \frac{\sin x}{x} \)