Exercises

1. $\lim\limits_{x \to 0^+} \arctan(\ln x) = ?$ Explain your answer.

2. Suppose $f(x) = \dfrac{p(x)}{q(x)}$, where p and q are quadratic polynomials; the line $x = 4$ is a vertical asymptote for the graph; the only x-intercept occurs when $x = 1$; there is a removable discontinuity when $x = -1$; and $\lim\limits_{x \to -1} f(x) = 2$. Determine $\lim\limits_{x \to \infty} f(x)$.

3. If $f(x) = \begin{cases} x^2 \sin(1/x) & \text{when } x \neq 0, \\ 0 & \text{when } x = 0, \end{cases}$ does $f'(0)$ exist? Why or why not?