1. Find the following limits.

(a) \( \lim_{x \to 0} \frac{\ln(1-x)}{x^2} \)

(b) \( \lim_{x \to \pi/2} (2x - \pi) \tan^{-1} x \)
2. Let $f(x) = \frac{\ln x}{x}$, $x > 0$.
   
   (a) Find $f'(x)$.

   (b) Find the interval(s) on which $f$ is increasing, and the interval(s) on which $f$ is decreasing.
3. Let \( f(x) = xe^{-2x} \).
(a) Find \( f'(x) \).

(b) Find all local maximum and minimum values of \( f \).

(c) Find the interval(s) on which \( f \) is concave up, the interval(s) on which \( f \) is concave down, and any inflection points.
4. Find the absolute maximum and absolute minimum values of \( f(x) = \sin(x) + \frac{1}{2} \sin(2x) \) on the interval \([0, 2\pi]\).
5. A cylindrical can without a top is made to contain a volume of 100 cm$^3$. Find the radius and height of such a can with minimal surface area.