1. Where is the function \( f(x) = \frac{\ln x + \tan^{-1} x}{x^2 - 1} \) continuous?

2. Use the graph of \( f(x) = \frac{1}{x} \) to find the largest number \( \delta > 0 \) such that
   
   for all \( x, 0 < |x - 2| < \delta \Rightarrow |f(x) - \frac{1}{2}| < \frac{1}{8}. \)
3. For what values of $a$ and $b$ is

$$g(x) = \begin{cases} 
ax - 2b & x \leq 0 \\
x^2 + 3a - b & 0 < x \leq 2 \\
3x - 5 & x > 2
\end{cases}$$

continuous at every $x$?

4. Use the Intermediate Value Theorem to prove that the equation $\cos x = x$ has a solution on the interval $[0, \frac{\pi}{2}]$. 