SAMPLE TEST # 1

Solve the exercises. Show your work.

Ex. 1. Find the derivatives of the following functions.
(a) \( h(x) = 2x^4 + \log_3(\cosh x) \)
(b) \( g(u) = \arccos(e^u) \)
(c) \( h(t) = \arctan^4(\ln t) \)
(d) \( y(x) = (\ln x)^{x^3} \)

Ex. 2. Evaluate the integrals.
(a) \( \int \frac{dx}{x(1 + (\ln x)^2)} \)
(b) \( \int \frac{\arctan t}{1 + t^2} \, dt \)
(c) \( \int \frac{e^{4x}}{1 + e^{4x}} \, dx \)

Ex. 3. Solve for \( x \) without using a calculator.
\( \ln x + \ln(x - 1) = \ln 2 \)

Ex. 4. Evaluate the limits.
(a) \( \lim_{x \to \infty} \frac{\ln(\ln x)}{\sqrt{x}} \)
(b) \( \lim_{x \to 0} \frac{\sin x - x}{x^3} \)
(c) \( \lim_{x \to \infty} x^3 e^{-x^2} \)

Ex. 5. Carbon extracted from an ancient skull contained only 1/6 as much radioactive C\(_{14}\) as carbon extracted from present day bone. How old is the skull? (The half life of radioactive carbon C\(_{14}\) is about 5700 years.)