PRACTICE EXAM FOR FIRST MIDTERM

(9 points) 1. Write the domain of each function

(a) \( f(x) = \sqrt{1 - x^2} \)
(b) \( g(x) = \frac{1}{1 - x^2} \)
(c) \( h(x) = \tan x \)

(10 points) 2. Solve the equation

\[ \ln(x^2 - 2) = 4 \]
for \( x \).

(12 points) 3. Let \( f(x) = x^2 + x \) for \( x \geq 0 \). Calculate \( f^{-1} \).

(10 points) 4. Let \( h(x) = \sin x \), \( g(x) = 1 - x^2 \), \( f(x) = e^x \). Write the function \( m(x) = f \circ g \circ h(x) \) explicitly.

(10 points) 5. Use a limit to calculate the derivative of the function \( f(x) = x - x^2 \).

(10 points) 6. Find the tangent line to the curve \( g(x) = x^2 + x \) at the point \((1, 2)\).

(10 points) 7. Calculate the derivative of \( f(x) = \sin(\sqrt{x + x^2}) \).

(10 points) 8. Calculate the derivative of \( h(x) = x^2 \cdot \cos x \).

(9 points) 9. Calculate the derivative of

\[ k(x) = \frac{x^2 + x}{\sin x} \]

(10 points) 10. Calculate the derivative of \( m(x) = \sin(x^3 - x^2) \).