Find the derivative of each function. **(24 points total)**

1. $f(x) = \arctan(\sec x)$

2. $g(x) = \sin^{-1}(e^x)$

3. $G(x) = e^{3x}(5x + 3)$

4. $R(x) = \frac{x - 1}{x + 5}$
5. Use logarithmic differentiation to find \( f'(x) \) if \( f(x) = \frac{(x + 5)^{3/2}(x - 1)^{5/2}}{(7x + 1)^{2/3}} \). (6 points)

6. Use implicit differentiation to find \( \frac{dy}{dx} \). Then find the slope of the line tangent to curve at \((-1, 1)\) (6 points)

\[
x^4 - x^2y + y^4 = 1.
\]
7. Record the derivatives of the following functions. (9 points total)

a. \( f(x) = \cos^{-1}(2x) \)  
b. \( g(x) = 3^x \)  
c. \( F(x) = \sin^3(4\pi x) \)
8. Rewrite the function that involves logarithms and then take the derivative of that re-written function. \textbf{(6 points total)}

\( f(x) = \ln \left[ \frac{x + 3}{x - 7} \right] \)

Rewrite: \( f(x) = \)

Differentiate: \( f'(x) = \)

\( g(x) = \ln (e^{5x}(x + 1)) \)

Rewrite: \( g(x) = \)

Differentiate: \( g'(x) = \)

\( h(x) = \ln \sqrt{x + 8} \)

Rewrite: \( h(x) = \)

Differentiate: \( h'(x) = \)