1. Find the derivative of each of the following functions. DO NOT SIMPLIFY!!

(6) \( f(x) = x^2 + 2x - 5 \)

(6) \( g(x) = \sin(x^2 + 3) \)

(6) \( y = \tan^{-1}(2x) \)

(6) \( f(x) = e^{2x} + \ln(x^2 - 1) \)

(6) \( f(x) = \cos(x) \sin(x) \)
(10) 2. Find and simplify the derivative of

\[ f(x) = \frac{x}{\sqrt{x^2 + 2}} \]

(10) 3. Use implicit differentiation to find \( y' \) if

\[ x^2 y + 2y = 4x^2 + 5 \]
4. The equation of motion of a particle is given by
\[ s = 2t^3 - 15t^2 + 36t + 2 \quad t \geq 0 \]

(5) (a) Find the velocity and acceleration of the particle (as a function of \( t \))

(5) (b) Find the acceleration at the instant(s) the velocity is 0.

(10) 5. Use the definitions of the hyperbolic trig functions to prove
\[ \tanh(\ln(x)) = \frac{x^2 - 1}{x^2 + 1} \]
(10) 6. Use a linear approximation to \( f(x) = \sqrt{x} \) at the point (8, 2) to find an approximate value for \( \sqrt{5} \)

(10) 7. Find an equation of the tangent to the curve \( y = e^x \) that is parallel to the line \( x - 4y = 1 \)

(10) 8. The volume of a cube is increasing at a rate of 10 cc/min. How fast is the surface area increasing when the length of an edge is 30cm?