1. Find the derivative of each of the following functions:

(a) \( f(x) = x^2 + 7x - 5 \)

(b) \( g(t) = t \sin(t) \)

(c) \( h(x) = \frac{\sec(x) + \tan(x)}{x^2 + 1} \)

(d) \( f(x) = e^{3x} \)

(e) \( f(x) = \tan^{-1}(2x) \)
2. Find and simplify the derivative of

\[ f(x) = \frac{x^2 + 2}{\sqrt{x^2 - 5}} \]

3. If \( f(x) = \sec^{-1}(x) \), what is \( f'(x) \) and what is the exact value of \( f(-2\sqrt{3}/3) \)?

4. The graph of a function \( f \) goes through the point \( (3, 5) \) and \( f'(x) = \sqrt{x^2 + 16} \). Approximate \( f(3.01) \) using either differentials or a linear approximation.
5. The following is the graph of the derivative of a function $f$.

(5) (a) At what $x$ values is the second derivative equal to zero?

(5) (b) At what $x$ values does the function have a horizontal tangent?

(5) (c) If $f(-1) = 2$, what is an equation of the line tangent to the graph of $f$ when $x = -1$?

(5) (d) Where is the second derivative of $f$ positive and where is it negative?
(15) 6. A shape of a cylinder is changing in such a way that the volume is always $256\pi$ cubic millimeters. If the height is decreasing at a rate of $1\text{mm/sec}$, how fast is the radius increasing at the instant the radius is $4\text{mm}$?
(10) 7. Suppose the following equation implicitly defines $y$ as a function of $x$. Find an equation of the tangent to the graph of the equation at the point (1,1).

$$\sqrt{x^2 + y^2} + 2xy = \sqrt{x + y} + x^2 y^2 + 1$$