1. Let \( y = \sin(2x) + x^{517} \). Compute \( y^{(1000)} \), the 1000th derivative of \( y \).

2. Is there a number \( x \) in \((0, \pi/2)\) at which the tangent to \( y = \sin(2x) \) and \( y = \tan x \) have the same slope?

3. Let \( f(x) = \sin^3(x^2) \). Find the equation of the tangent line to \( y = f(x) \) at \( x = \sqrt{\pi/4} \).

4. Assume \( y = f(x) \) and \( y = g(x) \) are differentiable functions, \( f(3) = 2, f'(3) = 3, g(2) = 3, g'(2) = 5, f(3) = 2 \). Let \( h(x) = f(g(x)) \) and \( k(x) = g(f(x)) \). Find \( h'(2) \) and \( k'(3) \).

5. Find the equation of the tangent line to the graph of the function \( y = f(x) \) at the point \((1,0)\) if the function satisfies the equation
\[
x \cdot f(x)^2 + \ln(x + f(x)) = x^3 - \cos(xf(x))
\]

6. Differentiate: (a) \( f(x) = \frac{\arctan x}{\ln(3x + 1)} \), (b) \( f(x) = \arctan((\sin x)^{1/3}) \).

7. A function \( y = f(x) \) satisfies
\[
(x - y)^3 = x^2 - y^2 - 2
\]
Find the equation of the tangent to the graph of this function at the point \((2,1)\). At which point does the tangent cross the \( x \)-axis and at what angle?

8. A function \( y = f(x) \) satisfies
\[
xy = y^2 - 1
\]
Determine the first derivative \( y' \) and the second derivative \( y'' \) of this function at the point \((0,1)\).