Problem 1. Calculate the derivative

\[
\sin^2(e^{3x+1})
\]

Here we use chain rule twice:

\[
\begin{align*}
\frac{d}{dx}(\sin^2(e^{3x+1})) &= 2\sin(e^{3x+1}) \frac{d}{dx}(\sin(e^{3x+1})) \\
&= 2\sin(e^{3x+1}) \cos(e^{3x+1}) \frac{d}{dx}(e^{3x+1}) \\
&= 6\sin(e^{3x+1}) \cos(e^{3x+1}) e^{3x+1}
\end{align*}
\]

(2)

\[
y = x^3 \cdot 3^x
\]

\[
\frac{dy}{dx} = 3x^2 \cdot 3^x + x^2 \cdot 3^x \ln 3
\]

Problem 2. Find the tangent line to the curve \(9x^2 = y^2\) at (1,3).

We use logarithmic differentiation here

\[
\ln(9x^2) = \ln y^2
\]

\[
\ln 9 + x \ln x = 2 \ln y
\]

\[
\frac{d}{dx}(\ln 9 + x \ln x) = \frac{d}{dx}(2 \ln y)
\]

\[
x + x \cdot \frac{1}{x} = 2 \cdot \frac{1}{y} \frac{dy}{dx}
\]

\[
\frac{dy}{dx} = \frac{y}{2} (x + 1)
\]

\[
\frac{dy}{dx} \big|_{(1,3)} = \frac{3}{2} (1 + 1) = 3
\]

By the formula of tangent line, we have

\[
y - 3 = 3(x - 1)
\]

or

\[
y = 3x
\]