1. **Problem**

What is the derivative of $f(x) = x^7 e^{3.9x}$, evaluated at $x = 0.51$?

Solution

Using the product rule for $f(x) = g(x) \cdot h(x)$, where $g(x) := x^7$ and $h(x) := e^{3.9x}$, we obtain

$$
\begin{aligned}
f'(x) &= [g(x) \cdot h(x)]' = g'(x) \cdot h(x) + g(x) \cdot h'(x) \\
&= 7x^{7-1} \cdot e^{3.9x} + x^7 \cdot e^{3.9x} \cdot 3.9 \\
&= e^{3.9x} \cdot (7x^6 + 3.9x^7) \\
&= e^{3.9x} \cdot x^6 \cdot (7 + 3.9x).
\end{aligned}
$$

Evaluated at $x = 0.51$, the answer is

$$
e^{3.9 \cdot 0.51} \cdot 0.51^6 \cdot (7 + 3.9 \cdot 0.51) = 1.155964.
$$

Thus, rounded to two digits we have $f'(0.51) = 1.16$.