

1. Problem

What is the derivative of $f(x) = x^8 e^{3.4x}$, evaluated at $x = 0.78$?

- (a) 26.54
- (b) 19.93
- (c) 21.87
- (d) 13.87
- (e) 20.28

Solution

Using the product rule for $f(x) = g(x) \cdot h(x)$, where $g(x) := x^8$ and $h(x) := e^{3.4x}$, we obtain

$$\begin{aligned} f'(x) &= [g(x) \cdot h(x)]' = g'(x) \cdot h(x) + g(x) \cdot h'(x) \\ &= 8x^{8-1} \cdot e^{3.4x} + x^8 \cdot e^{3.4x} \cdot 3.4 \\ &= e^{3.4x} \cdot (8x^7 + 3.4x^8) \\ &= e^{3.4x} \cdot x^7 \cdot (8 + 3.4x). \end{aligned}$$

Evaluated at $x = 0.78$, the answer is

$$e^{3.4 \cdot 0.78} \cdot 0.78^7 \cdot (8 + 3.4 \cdot 0.78) = 26.536421.$$

Thus, rounded to two digits we have $f'(0.78) = 26.54$.

- (a) True
- (b) False
- (c) False
- (d) False
- (e) False