Quiz 3

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Problem 1. Let $f(x) = 3e^x \cos x$. Find $f'(\pi/3)$. Do not round.

Solution: Let $g(x) = 3e^x$ and $h(x) = \cos x$, then $f(x) = g(x) \cdot h(x)$. By the product rule

$$f'(x) = g'(x) \cdot h(x) + g(x) \cdot h'(x)$$

Since $g'(x) = 3e^x$ and $h'(x) = -\sin x$, then $f'(x) = 3e^x \cos x - 3e^x \sin x = 3e^x(\cos x - \sin x)$. Finally,

$$f'(\pi/3) = 3e^{\pi/3}(\cos(\pi/3) - \sin(\pi/3)) = 3e^{\pi/3}(1/2 - \sqrt{3}/2) = (3/2)e^{\pi/3}(1 - \sqrt{3}).$$

Problem 2. Let $y = 2(3e^x + 100)^{10}$. Find dy/dx.

Solution: Let $g(x) = 2x^{10}$ and $h(x) = 3e^x + 100$, then $y = g(h(x))$. By the chain rule

$$\frac{dy}{dx} = g'(h(x)) \cdot h'(x).$$

Since $g'(x) = 20x^9$ and $h(x) = 3e^x$, then

$$\frac{dy}{dx} = 20(3e^x + 100)^9 \cdot (3e^x) = 60e^x(3e^x + 100)^9.$$