

Simplify your final answer. Show all relevant work for each problem. Little to no work, even with a correct answer, will receive little to no credit.

1. Find the second derivative of $h(x) = 2x^3 \ln(4x)$.

$$h'(x) = 6x^2 \ln(4x) + 2x^3 \frac{4}{4x}$$

$$h'(x) = 6x^2 \ln(4x) + 2x^2$$

$$h''(x) = 12x \ln(4x) + 6x^2 \frac{4}{4x} + 4x$$

$$h''(x) = 12x \ln(4x) + 6x + 4x$$

$$h''(x) = 12x \ln(4x) + 10x$$

2. Use implicit differentiation to find $\frac{dy}{dx}$ given $3 \sin(x) \cos(y) = 20$. Simplify your final answer as much as possible (no fractions).

$$3 \sin(x) \cos(y) = 20$$

$$\Rightarrow 3 \cos(x) \cos(y) + 3 \sin(x) (-\sin(y)) \frac{dy}{dx} = 0$$

$$\Rightarrow 3 \cos(x) \cos(y) = 3 \sin(x) \sin(y) \frac{dy}{dx}$$

$$\Rightarrow \frac{\cos(x) \cos(y)}{\sin(x) \sin(y)} = \frac{dy}{dx}$$

$$\Rightarrow \cot(x) \cot(y) = \frac{dy}{dx}$$