Problem 1. Compute the derivative of

$$f(x) = e^{2x} + (x^2 + 1)^3.$$

Do not simplify your answer after finding the derivative.

<u>**Solution**</u>: By the sum rule, we have

$$\frac{d}{dx}\left[e^{2x} + (x^2+1)^3\right] = \frac{d}{dx}\left[e^{2x}\right] + \frac{d}{dx}\left[(x^2+1)^3\right].$$

By the chain rule, we may continue:

$$\begin{aligned} &= e^{2x}\frac{d}{dx}[2x] + 3(x^2+1)^2\frac{d}{dx}\left[x^2+1\right] \\ &= 2e^{2x} + 3(x^2+1)^2 2x. \end{aligned}$$

Problem 2. Compute the derivative of

$$f(x) = \sin(2x)\ln(\cos(x)).$$

Do not simplify your answer after finding the derivative.

<u>**Solution**</u>: We first employ the product rule:

$$\frac{d}{dx}[\sin(2x)\ln(\cos(x))] = \frac{d}{dx}[\sin(2x)]\ln(\cos(x)) + \sin(2x)\frac{d}{dx}[\ln(\cos(x))].$$

Now by the chain rule, we may continue:

$$\begin{aligned} &= \cos(2x)\frac{d}{dx}[2x]\ln(\cos(x)) + \sin(2x)\frac{1}{\cos(x)}\frac{d}{dx}[\cos(x)] \\ &= 2\cos(2x)\ln(\cos(x)) + \sin(2x)\frac{1}{\cos(x)}(-\sin(x)) \end{aligned}$$