Problem 1. Compute the derivative of

$$f(x) = 2x\sin(x) + \frac{1}{\sqrt{x}}.$$

Do not simplify your answer after finding the derivative.

Solution: Using the sum rule and then the product rule, we have that

$$\begin{aligned} f'(x) &= \frac{d}{dx}\left[2x\sin(x) + \frac{1}{\sqrt{x}}\right] \\ &= \frac{d}{dx}\left[2x\sin(x)\right] + \frac{d}{dx}\left[x^{-1/2}\right] \\ &= \frac{d}{dx}\left[2x\right]\sin(x) + 2x\frac{d}{dx}\left[\sin(x)\right] + \frac{d}{dx}\left[x^{-1/2}\right] \\ &= 2\sin(x) + 2x\cos(x) - \frac{1}{2}x^{-3/2}. \end{aligned}$$

Problem 2. Compute the derivative of

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

Do not simplify your answer after finding the derivative.

Solution: Using the quotient rule, we have that

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