Worksheet 5

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1. Consider the function $f(x) = x^2 + 5x + 3$.
   a. Compute the first derivative $f'(x)$.
   b. Compute the second derivative $f''(x)$.
   c. Compute the third derivative $f'''(x)$.
2. Consider the function $f(x) = \sqrt{x}$.
   a. Compute the first derivative $f'(x)$.
   b. Compute the second derivative $f''(x)$.
   c. Compute the third derivative $f'''(x)$.
3. Use the chain rule to complete the following derivatives. Before differentiating anything, make sure to write explicitly the functions $g(x)$ and $h(x)$ are such that $f(x) = g \circ h(x)$.
   a. $f(x) = e^{x^2}$
   b. $f(x) = \cos(\sin(x))$
   c. $f(x) = \left(x^2 + x\right)^{1/3}$
   d. $f(x) = \sqrt{1 - x}$
4. Calculate the derivative of the function $f(x) = \ln\left(x\sqrt{x^2 - 1}\right)$.
5. Find the derivative of $f(x) = x^x$. [Hint: Use logarithmic differentiation!]