For this worksheet, you will need to know the differentiation rules for sums, products, reciprocals, and quotients. You also need to know that \( \frac{d}{dx} \ln x = \frac{1}{x} \). Try to treat constants as such to simplify the calculations, e.g., \( \frac{5}{x} = 5\left(\frac{1}{x}\right) \).

1. Differentiate the following functions.
   (a) \( f(x) = x^5 \cos x \).
   (b) \( u = (2x + 1)5^x \)
   (c) \( g(s) = s^5 - 2se^s \)
   (d) \( h(t) = \frac{1}{4}t^2 \ln t \).
   (e) \( y = \frac{1}{x^3 + 3x + 1} \)
   (f) \( y = \frac{4}{e^t + 1} \)
   (g) \( w = \frac{x}{x^2 + 2} \)
   (h) \( y = \frac{x \sin x}{2^x + 1} \)

2. Find the tangent line at the indicated point.
   (a) \( y = xe^x - 1 \) at \( x = 0 \)
   (b) \( y = x \ln x \) at \( x = 1 \)

3. Use the rules to derive the formulas for the derivatives of the following functions.
   (a) \( \tan x \)
   (b) \( \sec x \)
   (c) \( \cot x \)
   (d) \( \csc x \)