Work in groups of 3 or 4. Show your work. Acknowledge any help on these specific problems.

1. Let \( f(x) = \begin{cases} \frac{m}{x} + b & \text{if } x < 1 \\ \frac{2}{x} & \text{if } x \geq 1 \end{cases} \).

(a) Find the values of \( m \) and \( b \) that make \( f \) differentiable.

(b) Graph the resulting \( f \).
2. Compute the following derivatives:

(a) \( f(x) = 2 \Rightarrow f'(x) = \)

(b) \( f(x) = 2x \Rightarrow f'(x) = \)

(c) \( f(x) = 2x^3 \Rightarrow f'(x) = \)

(d) \( \frac{d}{dx} \left[ x^{3/4} \right] = \)

(e) \( \frac{d}{dx} \left[ x^{-3/4} \right] = \)

(f) \( \frac{d}{dx} \left[ x + \frac{1}{x} \right] = \)

(g) \( D_x [3 \sin(x)] = \)

(h) \( D_x [x \sin(3)] = \)

(i) \( D_x [\pi \cot(x)] = \)

(j) \( (\sqrt{x})' = \)
3. Compute the following derivatives:

\[
\begin{align*}
&\text{(a) } y = \sin(x)(x^8 + x^5 + 3) \Rightarrow \frac{dy}{dx} = \\
&\text{(b) } y = \sin(x)(x^8 + x^5 + 3)(\cos(x) + \sqrt{x}) \Rightarrow \frac{dy}{dx} = 
\end{align*}
\]
4. Compute the following derivatives:

(a) \[ y = \frac{\sin(x)}{x^8 + x^5 + 3} \Rightarrow \frac{dy}{dx} = \]

(b) \[ y = \frac{\sin(x)}{\cos(x) + \sqrt{x}} \Rightarrow \frac{dy}{dx} = \]