3. (6 points) Write the **limit definition** for the derivative of \( \log(x^2 + 2) \) with respect to \( x \). (There is no need to simplify or to attempt to find the limit.)

If \( f(x) = \log(x^2 + 2) \), then
\[
 f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}
\]

So in this case the derivative is,

\[
\lim_{h \to 0} \frac{\log((x+h)^2 + 2) - \log(x^2 + 2)}{h}
\]

4. (9 points) Consider the function \( y = j(x) \) graphed below.

Fill in the blanks with all the labelled \( x \) values (if any) on the graph satisfying each of the specified conditions. If there are no values which satisfy the condition, write “none.”

- The function \( j \) is discontinuous here: \( g, h \)
- The function \( j \) is not differentiable here: \( b, d, g, h \)
- The function \( j' \) is zero here: none
- The function \( j' \) is negative here: \( e \)
- The function \( j'' \) is positive here: \( a \)