

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 $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

So in this case the derivative is,

$$\bullet \lim_{h \rightarrow 0} \frac{\log((x+h)^2 + 2) - \log(x^2 + 2)}{h}$$

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