

12. [8 points] Let W be the differentiable function given by

$$W(p) = \begin{cases} 4 \ln(2) + 4 \ln(-p) & \text{if } p \leq -0.5 \\ 2 \sin(4p^2 - 1) & \text{if } -0.5 < p < 0.5 \\ \frac{\arctan(2p - 1)}{p^2} & \text{if } p \geq 0.5. \end{cases}$$

- a. [4 points] Use the limit definition of the derivative to write an explicit expression for $W'(3)$. *Your answer should not involve the letter W . Do not evaluate or simplify the limit.* Please write your final answer in the answer box provided below.

Answer: $W'(3) =$

- b. [4 points] With W as defined above, consider the function g defined by

$$g(t) = \begin{cases} ct + k & \text{if } t \leq 0 \\ W(-e^t) & \text{if } t > 0 \end{cases}$$

for some constants c and k . Find all values of c and k so that $g(t)$ is differentiable. Show your work carefully, and leave your answers in exact form.

If no such values of c and/or k exist, write NONE in the appropriate answer blank and be sure to justify your reasoning.

Answer: $c =$ _____ and $k =$ _____