

2. [5 points] The logistic function, which is frequently used in machine learning applications, is given by the formula

$$S(r) = \frac{1}{1 + e^{-2r}}.$$

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

*Solution:*

$$S'(3) = \lim_{h \rightarrow 0} \frac{\frac{1}{1 + e^{-2(3+h)}} - \frac{1}{1 + e^{-6}}}{h}.$$