

6. [10 points] Let  $\ell(t) = \frac{1}{1 + e^{-t}}$ .

- a. [5 points] Use the limit definition of the derivative to write an explicit expression for  $\ell'(-2)$ . Your answer should not involve the name of the function,  $\ell$ . Do not attempt to evaluate or simplify the limit. Write your final answer in the answer box provided below.

Answer:  $\ell'(-2) =$

- b. [3 points] Evaluate each of the limits below. Give exact answers. If a limit does not exist, including if it diverges to  $\pm\infty$ , write DNE. You do not need to show work.

i.  $\lim_{t \rightarrow 0} \ell(t)$

Answer: \_\_\_\_\_

ii.  $\lim_{t \rightarrow \infty} \ell(t)$

Answer: \_\_\_\_\_

iii.  $\lim_{t \rightarrow -\infty} \ell(t)$

Answer: \_\_\_\_\_

- c. [2 points] The function  $\ell(t)$  defined above is called the *logistic* function, and you encountered it on Team HW 2. The logistic function is neither even nor odd, but it is possible to shift the graph of  $\ell(t)$  to obtain a function that *is* even or odd. Fill in the blanks below to make a TRUE STATEMENT, following these guidelines:

- in the first blank, write UP, DOWN, LEFT, or RIGHT;
- in the second blank, write a positive number;
- in the third blank, write EVEN or ODD.

*No justification is needed.*

“If you shift the graph of  $\ell(t)$  \_\_\_\_\_ by \_\_\_\_\_, the resulting function is \_\_\_\_\_.”