

3. [4 points] Find positive constants  $a$ ,  $b$ , and  $c$  such that the function

$$f(x) = \begin{cases} \ln(ce - x) & x \leq 0 \\ \frac{ax^3 + \pi}{x^b + 1} & x > 0 \end{cases}$$

is continuous and satisfies  $\lim_{x \rightarrow \infty} f(x) = 4$ . Show your work, and write your answers in exact form.

**Answers:**  $a =$  \_\_\_\_\_  $b =$  \_\_\_\_\_  $c =$  \_\_\_\_\_

4. [5 points] Let

$$Q(w) = w^w + \cos(6w - 1).$$

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

**Answer:**  $Q'(3) =$