

2. [8 points] Consider the family of functions

$$g(x) = a \ln(x) + \frac{b}{x},$$

defined for  $x > 0$ , where  $a$  and  $b$  are positive constants.

- a. [2 points] Any function  $g(x)$  in this family has only one critical point. In terms of  $a$  and  $b$ , what is the  $x$ -coordinate of that critical point? Show your work.

**Answer:**  $x =$  \_\_\_\_\_

- b. [3 points] Is the critical point a local maximum, a local minimum, or neither? Circle your answer below. Use calculus, and be sure to show enough evidence to justify your answer.

**Answer:**    local max    local min    neither

- c. [3 points] Find values of  $a$  and  $b$  such that  $g(x)$  has a critical point at  $(e^2, 1)$ . Show your work.

**Answer:**  $a =$  \_\_\_\_\_

**Answer:**  $b =$  \_\_\_\_\_