

9. [13 points] Consider the function

$$f(x) = ax \ln x - bx$$

with domain $x > 0$, where a and b are positive constants. Note that this function has exactly one critical point.

a. [3 points] Find $f'(x)$.

b. [4 points] For which values of a and b does $f(x)$ have a critical point at $(e, -2)$?

c. [3 points] Using your values of a and b from part (b), is the critical point from (b) a local maximum, local minimum, or neither? Justify your answer.

d. [3 points] Using your values of a and b from part (b), find the x -coordinates of any inflection points of $f(x)$ or show that $f(x)$ has no inflection points.