

5. (14 points) A family of functions is given by  $r(x) = \frac{a}{x}e^{bx}$  for  $a, b$ , and  $x > 0$ .

(a) For what values of  $a$  and  $b$  does the graph of  $r$  have a local minimum at the point  $(4, 5)$ ? Show your work and **all supporting evidence** that your function satisfies the given properties.

(b) Write an explicit formula for  $r(x)$ . Circle your answer.

(c) Is the graph of  $r$  concave up or down for  $x > 0$ ? Explain using arguments based on calculus—not only from a graph.