10. [11 points] A function $P = f(r)$ and its first and second derivatives are given by the formulas

$$f(r) = \frac{c^2 r}{(r+k)^2} \qquad f'(r) = \frac{c^2(k-r)}{(r+k)^3}, \qquad \text{and} \qquad f''(r) = \frac{2c^2(r-2k)}{(r+k)^4},$$

where c and k are **positive** constants. Note that $f(r)$ is defined for all real numbers *except* $r = -k$. In this problem, you must use calculus to find and **justify** your answers. Make sure your final conclusions are clear, and that you show enough evidence to justify those conclusions.

a. [4 points] Find all **local extrema** of $f(r)$, and classify each as a max or a min. If there are none of a particular type, write NONE. Your answer may involve c and/or k.

Answer: Local min(s) at $r =$ ____________ and Local max(es) at $r =$ ____________

b. [4 points] Find all **global extrema** of $f(r)$ **on the interval** $[0, \infty)$. If there are none of a particular type, write NONE. Your answer may involve c and/or k.

Answer: Global min(s) at $r =$ ____________ and Global max(es) at $r =$ ____________

c. [3 points] Find values of the positive constants c and k so that the function $P = f(r)$ has an inflection point at $r = 4$ and a global maximum value of $P = 8$. *Show all work.*

Answer: $c =$ ____________ and $k =$ ____________