1. Calculate the limit of each function, provide a detailed calculation to get full credit. Write your final answer in the box.

(1).
\[ \lim_{x \to \infty} \frac{x^2}{e^x} \]

(2).
\[ \lim_{x \to 0^+} 2x \ln x \]
2. Let \( f(x) = \frac{3x^2}{x^2 - 9} \).

(1) Find the horizontal asymptotes.

(2) Find the vertical asymptotes.

(3) Find the critical numbers of \( f \)

(4) Find the intervals of increase and the intervals of decrease.

(5) Find the local maximal and minimum values.
(6). Analysis the signs of the second derivative $f''$

(7) Find the intervals of concavity and the inflection points.

(8) Use the information from parts (1)-(7) to sketch the graph of $f$. 
3. If $A$ is the area of a square with edge length $x$ and the area of the square expands at the constant rate of $300cm^2/sec$. Find the rate at which the edge length $x$ increases when $x = 10cm$. 