

Name: KEY

Show all work, clearly and legibly, to receive full credit. Correct spelling, organization of your solution, and proper use of mathematical notation all count. You may use a stand-alone graphing calculator, but not any internet-based calculators. No notes, books, or other additional resources are permitted. Good luck!

1.) (4 pts.) Let $f(x) = x^2$. The limit definition of the derivative at $x = 3$ is

$$f'(3) = \lim_{h \rightarrow 0} \frac{f(3+h) - f(3)}{h}$$

Work through just the first step of computing $f'(3)$ using this definition, substituting in for $f(3+h)$ and $f(3)$. You should not compute further.

$$\lim_{h \rightarrow 0} \frac{(3+h)^2 - (3)^2}{h}$$

2.) (4 pts.) Let $f(x) = \frac{x^2 - 9}{x + 3}$.

a.) What is $f(-3)$?

D.N.E.

b.) What is $\lim_{x \rightarrow -3} f(x)$, that is, what is $\lim_{x \rightarrow -3} \frac{x^2 - 9}{x + 3}$? Justify your answer using a graph and/or algebra.

$$\begin{aligned} &= \lim_{x \rightarrow -3} \frac{(x+3)(x-3)}{(x+3)} = \lim_{x \rightarrow -3} (x-3) = -3-3 \\ &= \boxed{-6} \end{aligned}$$

3.) (2 pts.) Simplify any negative exponents by writing an equivalent fraction having only positive exponents: klm^{-9} .

$$\frac{kl}{m^9}$$