

Name: _____ Academic Integrity Signature: _____

*I have abided by the UNCG Academic Integrity Policy.***Note:** Correct numerical answers without justification will receive little or no credit.1. Let f be a differentiable function.(a) (4 points) The *linearization of f at a* is the approximating function

$$\textbf{Solution: } L(x) = f(a) + f'(a)(x - a).$$

(b) (3 points) The *differential of f* is

$$\textbf{Solution: } df = f'(x)dx.$$

2. (3 points) Compute the $\lim_{x \rightarrow 0} \frac{\sin x}{x^2 - x}$. Justify.**Solution:** We compute

$$\begin{aligned} \lim_{x \rightarrow 0} \frac{\sin x}{x^2 - x} &= \lim_{x \rightarrow 0} \frac{\cos x}{2x - 1} && \frac{0}{0} \text{ so use L'Hôpital} \\ &= \frac{\cos 0}{2(0) - 1} && \text{plug in } x = 0 \\ &= -1. \end{aligned}$$