1. [5 points] Let $h(x)$ be a differentiable function such that $h'(x)$ is also differentiable everywhere. Suppose that $h(3) = 9$, $h'(3) = 2$, and $h''(x) > 0$ for all real numbers x.

a. [2 points] Let $L(x)$ be the local linearization of $h(x)$ at $x = 3$. Find a formula for $L(x)$.

Solution: The graph of $L(x)$ is the tangent line to the graph of $y = h(x)$ at $x = 3$. This is a line of slope 2 passing through the point $(3, 9)$. So $L(x) = 9 + 2(x - 3)$.

Answer: $L(x) =$ $9 + 2(x - 3)$

b. [3 points] Which of the following equalities could be true?
Circle all the statements that could be true or circle NONE OF THESE.
You do not need to explain your reasoning.

Solution: Since $h''(x) > 0$ for all x, the graph of $h(x)$ is concave up so lies above the graph of $L(x)$. Therefore, $h(-1) > L(-1) = 9 + 2(-4) = 1$.

$h(-1) = -1$

$h(-1) = 0$

$h(-1) = 1$

$\boxed{h(-1) = 2}$

NONE OF THESE