

3. [5 points] Suppose $f(t)$ is a differentiable function whose tangent line at the point $t = 1$ is given by the linear function $L(t)$. To the right is a table consisting of some values of $f(t)$ and $L(t)$.

t	-1	1	3	5
$f(t)$	5	2	2	9
$L(t)$	3	2	1	0

- a. [1 point] Find the average rate of change of $f(t)$ on the interval $[-1, 5]$.

Answer: _____

- b. [1 point] Find the instantaneous rate of change of $f(t)$ at $t = 1$.

Answer: _____

- c. [1 point] Using the table, find the best possible estimate of $f'(-1)$.

Answer: _____

- d. [2 points] The function L is invertible, and its inverse function L^{-1} is also linear. Find numbers m and b such that $L^{-1}(x) = mx + b$.

Answer: $m =$ _____ and $b =$ _____

4. [5 points] Let $f(x)$, $g(x)$, and $h(x)$ be the functions defined for all real numbers by

$$f(x) = 2^{c+1}c^x, \quad g(x) = e^c \cos(cx), \quad \text{and} \quad h(x) = \begin{cases} f(x) & x \leq 0 \\ g(x) & x > 0 \end{cases}$$

where c is a nonzero constant. In each part below, find an exact value for the constant c so that the given condition holds. (*Your value for the constant c may be different in each part.*)

- a. [1 point] The function $f(x)$ has a continuous decay rate of 15%.

Answer: _____

- b. [1 point] The function $g(x)$ has a period of 3.

Answer: _____

- c. [3 points] The function $h(x)$ is continuous at zero.

Answer: _____