For all $a \in \mathbb{R}$ and $n \in \mathbb{Z}^+$, the function must have

$$f'(a) = \frac{f(a+n) - f(a)}{n} = \frac{\int_a^{a+n} f'(x)\,dx}{n}$$

Thus, the derivative must be periodic with interval 1. Assume that the derivative is not constant, meaning there exists b such that $f'(b) \neq f'(a)$. This implies

$$f'(a) = \frac{\int_a^{a+n} f'(x)\,dx}{n} \neq \frac{\int_b^{b+n} f'(x)\,dx}{n} = f'(b)$$

However this cannot be true since f' is periodic and the size of the intervals of integration are equal and a multiple of the period of f'. Thus the derivative must be constant, implying that the only class of functions that satisfy the condition are linear functions.