x	0	3	5	9
$g(x)$	-2	-1	$-\frac{1}{8}$	$-\frac{1}{20}$
$g'(x)$	4	$\sqrt{8}$	$\sqrt{3}$	$\frac{3}{4}$

BC 1: The functions f and g are twice differentiable. Selected values of $g(x)$ and $g'(x)$ are given in the table above. The function f is defined by $f(x) = 2 + \int_0^{3x} g(t)dt$.

(A) Explain why there must be a number c, for $0 < c < 9$, such that $g'(c) = \frac{1}{3}$.

(B) Evaluate $\int_0^3 40xf'''(x)dx$.

(C) Using a right Riemann sum with three subintervals indicated in the table above, approximate the length of the curve of $g(x)$ from $x = 0$ to $x = 9$.

(D) Let $P_n(x)$ denote the nth degree Taylor polynomial for f about $x = 0$. Find $P_2(x)$.

(E) Consider the geometric series $\sum_{n=0}^{\infty} ar^n$ whose first three terms are defined by the polynomial $P_2(x)$ found in part (D). Find the sum of this series when $x = \frac{1}{6}$, or show that the series diverges.

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