Find the derivative of \( f(x) = 5x^2 + x \) using the definition of derivative

\[
(1) \quad f'(x) = \lim_{h \to 0} \frac{(5(x+h)^2 + (x+h)) - (5x^2 + x)}{h}
\]

\[
(2) \quad f'(x) = \lim_{h \to 0} \frac{(5x^2 + 10xh + 5h^2 + (x+h)) - (5x^2 + x)}{h}
\]

\[
(3) \quad f'(x) = \lim_{h \to 0} \frac{10xh + 5h^2 + h}{h}
\]

\[
(4) \quad f'(x) = \lim_{h \to 0} \frac{h(10x + 5h + 1)}{h}
\]

\[
(5) \quad f'(x) = \lim_{h \to 0} (10x + 5h + 1)
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\[
(6) \quad f'(x) = 10 \lim_{h \to 0} x + 5 \lim_{h \to 0} h + \lim_{h \to 0} 1 \quad \text{evaluate the limits}
\]

\[
(7) \quad f'(x) = 10x + 5(0) + 1 = 10x + 1
\]

Step one is the definition of derivative
Step two – five is algebra simplification
Step six is using addition and scalar rule of limits
Step seven is evaluating the limits and simplifying