Answer on Question #73836 – Math – Calculus

Given: $f(x) = 4x^2 + 7x + 6$

To Find: Find the derivative by using definition at x=1.

Solution: The given function is $\qquad f(x) = 4x^2 + 7x + 6$

Derivative by definition at a point *x=a* is given by

$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

$\Rightarrow$ At x=1, $\qquad f(1+h) = 4(1+h)^2 + 7(1+h) + 6$

$$= 4(1 + h^2 + 2h) + 7 + 7h + 6$$

$$= 4h^2 + 15h + 17$$

and $\qquad f(1) = 4(1)^2 + 7(1) + 6$

$$= 17$$

$\therefore \qquad f'(1) = \lim_{h \to 0} \frac{f(1+h) - f(1)}{h}$

$\Rightarrow \qquad f'(1) = \lim_{h \to 0} \frac{4h^2 + 15h + 17 - 17}{h}$

$f'(1) = \lim_{h \to 0} \frac{4h^2 + 15h}{h}$

$f'(1) = \lim_{h \to 0} \frac{h(4h + 15)}{h}$

$f'(1) = \lim_{h \to 0} \frac{(4h + 15)}{1}$

$f'(1) = 15$

$\therefore$ The derivative by definition is $f'(1) = 15$.