Quiz #3

Directions: Carefully read each question below and answer to the best of your ability in the space provided. You **MUST** show your work to receive full credit! Your answer to problem # 2 should be written in a clear and concise manner using a combination of complete sentences and symbolic expressions. An answer without explanation or that is poorly presented may not receive full credit.

1. (1 point) Suppose f and g are continuous functions such that $g(3) = 2$ and

$$\lim_{x\to 3} [4f(x) + f(x)g(x)] = 54.$$

Find $f(3)$.

A. $\frac{54}{7}$

B. 5

C. 9

D. 0

E. You cannot find it because $f(3)$ may not exist.

2. (2 points) If $f(x) = 2x^2 + 5$, find $f'(3)$ using the definition of derivative, and use it to find an equation of the tangent line to the curve $y = 2x^2 + 5$ at the point $(3, 23)$.

Solution: First, let find the derivative of $f'(c)$, that is

$$\begin{aligned} f'(3) &= \lim_{h\to 0} \frac{f(3+h) - f(3)}{h} \\ &= \lim_{h\to 0} \frac{(2(3+h)^2 + 5) - (2\cdot 3^2 + 5)}{h} \\ &= \lim_{h\to 0} \frac{(2(9 + 2\cdot 3\cdot h + h^2) + 5) - 23}{h} \\ &= \lim_{h\to 0} \frac{18 + 12h + 2h^2 + 5 - 23}{h} \\ &= \lim_{h\to 0} \frac{12h + 2h^2}{h} \\ &= \lim_{h\to 0} \frac{h(12 + 2h)}{h} \\ &= \lim_{h\to 0} (12 + 2h) = 12. \end{aligned}$$

Then using slope-point formula for the line, we get

$$\begin{aligned} y &= m(x - x_0) + y_0 \\ &= f'(3)(x-3) + f(3) \\ &= 12(x-3) + 23 \\ &= \boxed{12x - 13}, \end{aligned}$$

which is the equation of the tangent line to the curve $y = 2x^2 + 5$ at the point $(3, 23)$.

Name: ______________________________

Question:	1	2	Total
Points:	1	2	3
Score:			