

Last Name: SOLUTIONS

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Quiz 5 (A)

Question 1. (10 marks) Let $f(x) = x^2 + 6x$ (a) Find the derivative of f .

(b) Find the point on the graph where the tangent line to the curve is horizontal.

(c) Find the equation of the tangent line to the curve at $x = 1$

$$\begin{aligned}
 \text{a) } f'(x) &= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{[(x+h)^2 + 6(x+h)] - [x^2 + 6x]}{h} \\
 &= \lim_{h \rightarrow 0} \frac{\cancel{x^2} + 2xh + h^2 + \cancel{6x} + 6h - \cancel{x^2} - \cancel{6x}}{h} = \lim_{h \rightarrow 0} \frac{h(2x + h + 6)}{h} \\
 &= \lim_{h \rightarrow 0} (2x + h + 6) = 2x + (0) + 6 = 2x + 6
 \end{aligned}$$

$$\text{b) } f'(x) = 2x + 6 = 0 \Rightarrow 2x = -6 \Rightarrow x = -3$$

$$f(-3) = (-3)^2 + 6(-3) = 9 - 18 = -9$$

$$\therefore (-3, -9)$$

$$\text{c) } f'(1) = 2(1) + 6 = 8 = m$$

$$f(1) = (1)^2 + 6(1) = 7 = y$$

$$\therefore y = mx + b$$

$$7 = 8(1) + b$$

$$-1 = b$$

$$\therefore y = 8x - 1$$