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Quiz 7

Problem 1

Given the function $G(x) = x^2 + 6x - 1$, calculate $G'(1)$ and find the equation of the tangent line at the point $P(1, G(1)) = P(1, 6)$.

Solution to the Problem 1

Derivative:

$$G'(1) = \lim_{h \rightarrow 0} \frac{G(1+h) - G(1)}{h} = \lim_{h \rightarrow 0} \frac{[(1+h)^2 + 6(1+h) - 1] - [1^2 + 6 \cdot 1 - 1]}{h} = \lim_{h \rightarrow 0} \frac{8h + h^2}{h} = \lim_{h \rightarrow 0} (8+h) = 8$$

Tangent line:

$$G'(1) = \frac{y - y_1}{x - x_1}$$
$$8 = \frac{y - 6}{x - 1}$$

So:

$$y = 8x - 2$$

Grading

2 points for

$$G'(1) = \lim_{h \rightarrow 0} \frac{G(1+h) - G(1)}{h}$$

1 point for

$$\lim_{h \rightarrow 0} \frac{[(1+h)^2 + 6(1+h) - 1] - [1^2 + 6 \cdot 1 - 1]}{h}$$

2 points for:

$$= \lim_{h \rightarrow 0} \frac{8h + h^2}{h} = \lim_{h \rightarrow 0} (8 + h)$$

1 point for:

$$= 8$$

2 points for

$$G'(1) = \frac{y - y_1}{x - x_1}$$
$$8 = \frac{y - 6}{x - 1}$$

and 2 points for getting the final answer:

$$y = 8x - 2$$