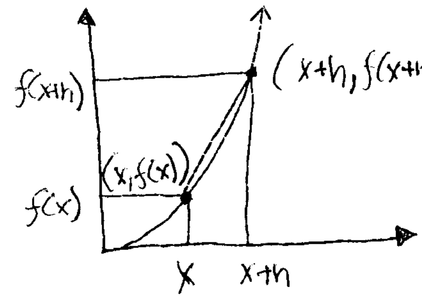
Math Analysis A Hand Written Quiz Prompt Given: $f(x) = x^2 + x$, $x = 2$

① Draw the graphic for the definition of a derivative



② Derive the slope of a tangent line to the curve (the derivative) formula.

$$\text{slope} = m = \frac{y_2 - y_1}{x_2 - x_1}$$

Slope of the secant

$$\text{slope} = m = \frac{f(x+h) - f(x)}{x+h-x}$$

slope of the tangent to the line

$$\text{slope} = m = \frac{f(x+h) - f(x)}{x+h-x}$$

slope of the tangent line to the curve

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

③ Given the function above, use the definition of the derivative to find the slope

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

$$f'(x) = \lim_{h \to 0} \frac{f(x+h)^2 + (x+h) - f(x^2+x)}{x+h-x}$$

$$f(x) = \lim_{h \to 0} \frac{\cancel{x^2} + 2xh + h^2 + \cancel{x} + h - \cancel{x^2} - \cancel{x}}{\cancel{x} + h - \cancel{x}}$$

$$f'(x) = \lim_{h \to 0} \frac{2xh + h^2 + h}{h}$$

$$f'(x) = \lim_{h \to 0} \frac{\cancel{h}(2x + h + 1)}{\cancel{h}}$$

$$f'(x) = \lim_{h \to 0} 2x + \cancel{h} + 1$$

$$f'(x) = 2x + 1$$

④ Check your answer using the power rule

$$f(x) = x^2 + x$$

$$f'(x) = 2(x^{2-1}) + 1$$

$$f'(x) = 2(x^1) + 1$$

$$f'(x) = 2x + 1$$

⑤ Find the equation of a line tangent to the curve at the given location. Show both slope intercept and standard form of the equation.

$f(x) = x^2 + x$, $x = 2$

$f(2) = (2)^2 + 2$ (2, 6)

$f(2) = 4 + 2$

$f(2) = 6$

slope $= m = 2x + 1$

$f'(x) = 2x + 1$

$f'(x) = 2(2) + 1$

$f'(x) = 4 + 1$

$f'(x) = 5$

Slope intercept form	Standard form
$y - y_1 = m(x - x_1)$	$y = 5x - \cancel{4}$
$y - 6 = 5(x - 2)$	$+4 \quad \cancel{+4}$
$y - 6 = 5x - 10$	$-y \quad -y$
$+6 \quad +6$	
$y = 5x - 4$	$4 = 5x - y$

⑥ $F(x) = \dfrac{x^{n+1}}{n+1} + C$ $f'(x) = 2x + 1$

$$F(x) = \frac{2x^{(1+1)}}{1+1} + 1x + C$$

$$F(x) = \frac{\cancel{2}x^2}{\cancel{2}} + x + C$$

$$F(x) = x^2 + x + C$$

C represents any constant that could have been lost during the derivative process.