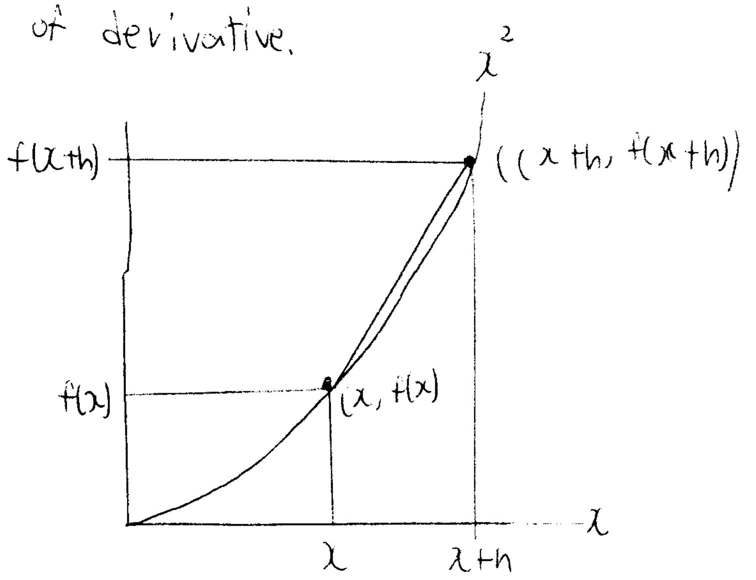
Given: $f(x) = x^2 + x$
$x = 2$

Math Analysis Handwritten Quiz

1. Draw the graphic for the definition of 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 is

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

slope of a tangent to the curve is

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

$f'(x)$ = 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.

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

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

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

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

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

4. Check your answer using power rule.

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

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

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

$$f(x) = x^2 + x$$
$$f(\cancel{x}2) = 2^2 + 2$$
$$f(2) = 4 + 2$$
$$f(2) = 6 \qquad (2, 6)$$

slope:

$$m = 2x + 1 = 2(2) + 1 = 5$$

$$y - y_1 = m(x - x_1)$$
$$y - 6 = 5(x - 2)$$
$$y - 6 = 5x - 10$$
$$+6 \qquad\quad +6$$
$$y = 5x - 4 \leftarrow \text{slope intercept Form}$$

$$y - 6 = 5x - 10$$
$$-5x \qquad -5x$$
$$-5x + y - 6 = -10$$
$$+6 \qquad +6$$
$$-5x + y = -4 \leftarrow \text{standard form}$$

6. Find the anti-derivative of the found derivative.

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

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

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

The constant of C represent any constants which might have lost in the derivative process.