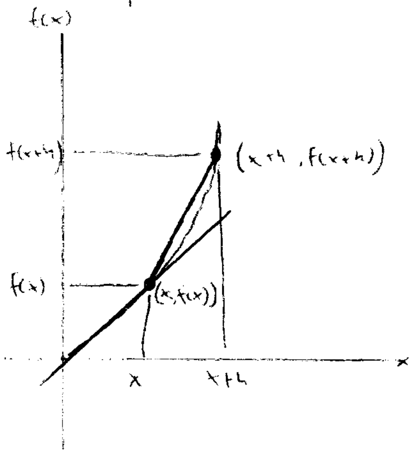
Math Analysis A Homework Quiz

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

1. Graphic



2 Derive the Formula of the Derivative

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

slope of the secant line is

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

slope of the derivative

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

$f'(x)$ is the slope of the derivative

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

3. Apply the Definition using the given

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

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

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

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

$$= \lim_{h \to 0} \frac{2xh + h^2 + h}{h}$$

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

$$= \lim_{h \to 0} 2x + \overset{\to 0}{h} + 1$$

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

4 Power Rule

$x^2 + x$

$2x^{2-1} + 1x^{1-1}$

$2x + 1 = f'(x)$ ✓

5 Find the Equation of the Derivative

$f(x) = x^2 + x$, $x = 2$ $\quad f'(x) = 2x + 1$

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

$= (2)^2 + 2$

$f(x) = 4 + 2$

$f(x) = 6$

$(2, 6)$

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

$= 2(2) + 1$

$= 4 + 1$

$f'(x) = 5$

$y_2 - y_1 = m(x_2 - x_1)$

$y - 6 = 5(x - 2)$

$y - 6 = 5x - 10$
$+6 \qquad +6$

$\boxed{y = 5x - 4}$

Slope-Intercept Form

$y - 6 = 5x - 10$

$y - 6 = (5x - 10)$

$y - x + 6 = -5$
$+6$

$-(y - 5x = -4)$

$\boxed{-y + 5x = 4}$

Standard Form

6. Anti Derivative

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

$$= \frac{2x^{(1+1)}}{1+1} + \frac{1x^{0+1}}{0+1} + C$$

$$= \frac{\cancel{2}x^2}{\cancel{2}} + \frac{1x^1}{1} + C$$

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

C represents the constant which may have been lost during the derivative process