Name: Sammit - Key **Unit 7 – Exploring Derivatives- Group Activity**

I. Average Rate of Change – Find the average rate of change of the function over the given interval

$f(x) = 2x - 5$; [3, 7]

$$\frac{f(7) - f(3)}{7-3} = \frac{9-1}{4} = \boxed{2}$$

$f(x) = x^2 + 3x$; [-1,3]

$$\frac{f(3) - f(-1)}{3-(-1)} = \frac{18+(+2)}{4} = \boxed{5}$$

$f(x) = \sqrt{x+4}$; [0, 5]

$$\frac{f(5) - f(0)}{5-0} \quad \frac{3-2}{5} = \boxed{\frac{1}{5}}$$

II. Formal Definition of Derivatives - Use the formal definition of derivatives to find the derivative and then evaluate at the given points. $\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

$f(x) = 2x - 5$; x = 3; x = 7 ② ②

$$\frac{2(x+h) - 5 - (2x-5)}{h}$$

$$\frac{\cancel{2x} + 2\cancel{h} - \cancel{5} - \cancel{2x} + \cancel{5}}{\cancel{h}}$$

$$= \boxed{2}$$

$f(x) = x^2 + 3x$; x = -1; x = 3 ① ⑨

$$\frac{(x+h)^2 + 3(x+h) - (x^2 + 3x)}{h}$$

$$\cancel{x^2} + 2xh + h^2 + \cancel{3x} + 3h - \cancel{x^2} - \cancel{3x}$$

$$\frac{\cancel{h}(2x + h + 3)}{\cancel{h}}$$

$$2x + 0 + 3$$

$$\boxed{2x+3}$$

$f(x) = \sqrt{x+4}$ [0, 5]; x=0; x = 5 $\frac{1}{4}$ $\frac{1}{6}$

$$\frac{\sqrt{x+h+4} - \sqrt{x+4}}{h} \cdot \frac{\sqrt{x+h+4} + \sqrt{x+4}}{\sqrt{x+h+4} + \sqrt{x+4}}$$

$$\frac{\cancel{x} + \cancel{h} + \cancel{4} - (\cancel{x} + \cancel{4})}{\cancel{h}(\sqrt{x+h+4} + \sqrt{x+4})} = \frac{1}{\sqrt{x+\cancel{h}+4} + \sqrt{x+4}}$$

$$\boxed{\frac{1}{2\sqrt{x+4}}}$$

III. Use the TI-89 calculator to find the derivative of the following:

$f(x) = 12$ 0 $f(x) = \pi$ 0 $f(x) = 42$ 0

$f(x) = -100$ 0 $f(x) = e$ 0 $f(x) = \frac{1}{2}$ 0

1. All of the above functions are constants and their derivative is 0
2. From our discussion on derivatives yesterday, explain why you think the derivative of all the above functions is 0.

The slope of a horizontal line is 0.