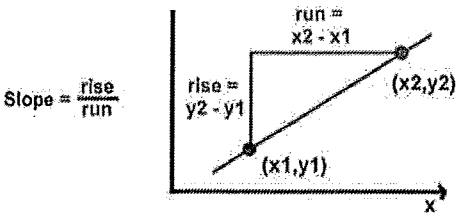
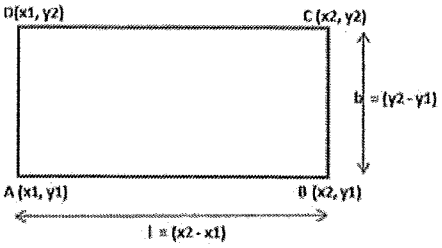
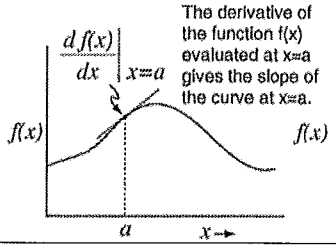
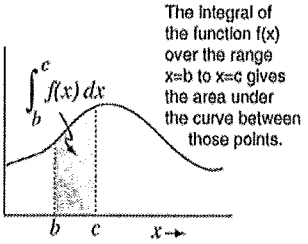
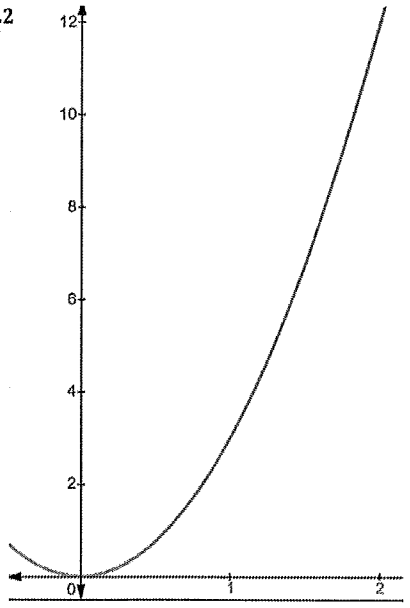
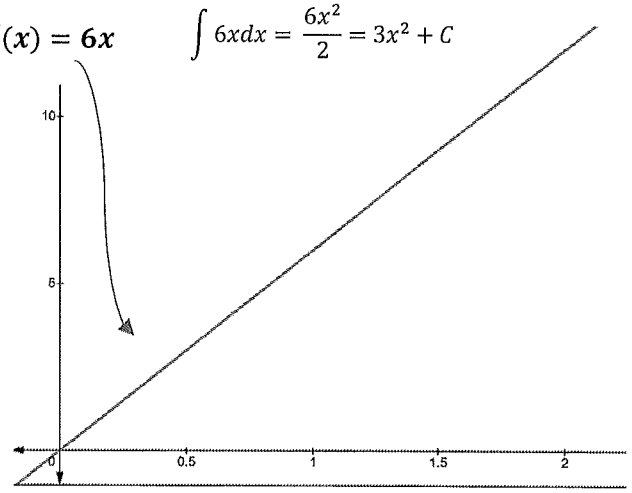
Differential Calculus vs Integral Calculus Summary Sheet

Differential Calculus (Derivative) **Explores rates of change**	**Integral Calculus (Antiderivative)** **Explores the accumulation of change**
$\textbf{\textit{Slope } } m = \frac{y_2 - y_1}{x_2 - x_1}$ 	$\textbf{\textit{Area}} = (x_2 - x_1) \times (y_2 - y_1)$ 
Derivative $\frac{d\,f(x)}{dx}$ 	*Integral* $\int f(x)\,dx$ 
$f(x) = 3x^2$ $\frac{d}{dx} 3x^2 = 6x$ 	$f'(x) = 6x$ $\int 6x dx = \frac{6x^2}{2} = 3x^2 + C$ 
* *The* ***area under*** *the derivative graph is equal to the* ***rise in height*** *of the antiderivative graph*	* *The average slope of the antiderivative graph is equal to the average height of region under derivative graph* $Avg\ value\ f(c) = \frac{1}{b-a}\int_a^b f(x)dx$
Second Fundamental Theorem of Calculus (SFTC) $\frac{d}{dx}\left[\int_a^{p(x)} \boldsymbol{f}(t)dt\right] = \boldsymbol{f}(p(x)) * p'(x)$	*First Fundamental Theorem of Calculus (FFTC)* $\int_a^b f'(x)dx = f(a) - f(b)$

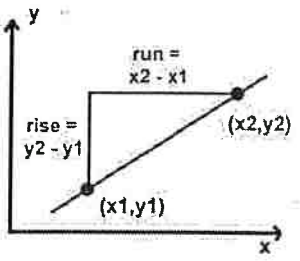
Key

Differential Calculus vs Integral Calculus Summary Sheet

Differential Calculus (Derivative)

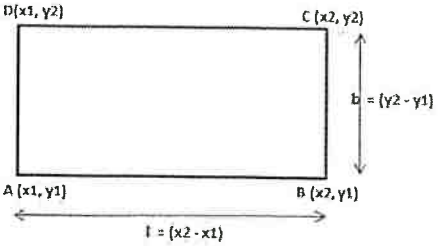
$$Slope\ m = \frac{y_2 - y_1}{x_2 - x_1}$$

Slope = $\frac{rise}{run}$



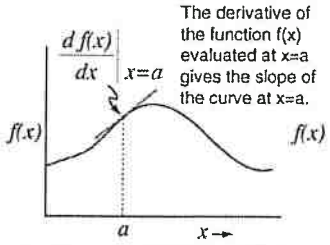
Integral Calculus (Antiderivative)

$$Area = (x_2 - x_1) \times (y_2 - y_1)$$



Derivative

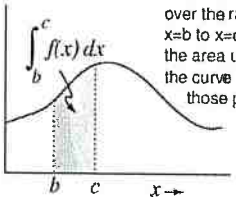
$$\frac{d\,f(x)}{dx}$$



The derivative of the function f(x) evaluated at x=a gives the slope of the curve at x=a.

Integral

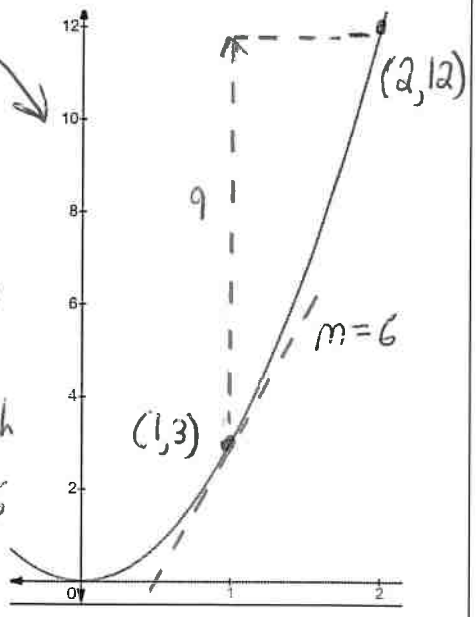
$$\int f(x)\,dx$$



The integral of the function f(x) over the range x=b to x=c gives the area under the curve between those points.

$$f(x) = 3x^2$$

$$\frac{d}{dx}3x^2 = 6x$$

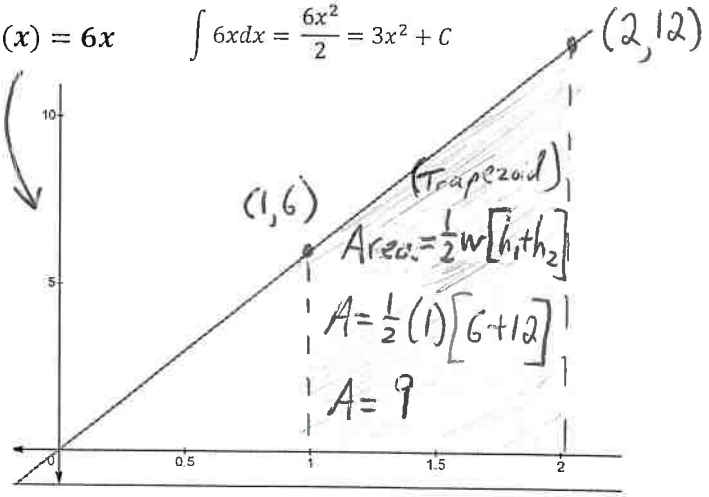


- The derivative function can find the slope of any point on this graph

ex: $f'(1) = 6(1) = 6$

$f(2) - f(1) = 12 - 3 = \boxed{9}$

$$f'(x) = 6x \qquad \int 6x\,dx = \frac{6x^2}{2} = 3x^2 + C$$



- The Integral of this function can be used to find the area under this graph.

$$\int_1^2 6x\,dx = \frac{6x^2}{2} \to 3x^2\Big]_1^2 = 3(2)^2 - 3(1)^2 = \boxed{9}$$

Second Fundamental Theorem of Calculus (SFTC)

$$\frac{d}{dx}\left[\int_a^{p(x)} f(t)dt\right] = f(p(x)) * p'(x)$$

First Fundamental Theorem of Calculus (FFTC)

$$\int_a^b f'(x)dx = f(a) - f(b)$$