Name: ________________________________ Date: __________

AP Calc: Relationship Between Area under the curve and the Definite Integral

Do Now:

1. $\int_0^1 x^2 dx =$

2. $\int_{-\pi}^{\frac{\pi}{3}} \sin x dx =$

If a function f is continuous on $[a,b]$ and if $f(x) \geq 0$ for all x in $[a,b]$ then the area under the curve $y = f(x)$ over the interval $[a,b]$ is defined by:

$$Area = \lim_{n \to +\infty} \sum_{k=1}^{n} f(x_k)\Delta x$$

Which can be rewritten as : $Area = \int_a^b f(x)dx$

Recall the FTC Part I:

Corollary:

Let's find the total area bounded by the curve $y = \sin x$ and the x-axis from $\left[-\pi, \frac{\pi}{3}\right]$.

Examples:

1. Find the value of $\int_{-2}^{3} x^3 dx =$

2. Find the area bounded by $y = x^3$ and the x-axis from $x = -2$ to $x = 3$.

3. Find the value of $\int_{-2}^{2} (x^3 - 4x)dx =$

4. Find the area bounded by $y = x^3 - 4x$ and the x-axis from $x = -2$ to $x = 2$.

A note about evaluating integrals:

$\int_{-a}^{a}$ odd function $=$

$\int_{-a}^{a}$ even function $=$