Exact Area under a Curve

Ex. 1 Approximate the area under the graph of $f(x)=x^2$ on the interval $[0,2]$ using a right Riemann sum with:

a) 4 subintervals	**b)** 16 subintervals	**c)** 64 subintervals	**d)** 256 subintervals

Write an expression that can be used to evaluate the exact area under the graph of $f(x)=x^2$ on the interval $[0,2]$.

The definite integral is simply the limit of a Riemann sum as the width of each interval gets smaller and smaller as indicated in the formula above.

KEY QUESTION: Does the definite integral always equal the area?

The **integral** option in your calculator uses Riemann sums with $\Delta x = 0.0001$. It computes the area of each rectangle and gives the sum of all the rectangles from $x = a$ to $x = b$.

Ex. 2 For each of the following functions, sketch a quick graph and shade the indicated region. Use the **integral** feature of your calculator to approximate the value of each definite integral.

a) $\int_0^2 x^2\ dx$	b) $\int_2^0 x^2\ dx$
c) $\int_{-2}^0 x^2\ dx$	d) $\int_0^2 -x^2\ dx$

Examples: Find the area of the region enclosed by the graph and the *x*-axis on the given interval

1) $f(x)=2x+1;a=0,b=2$	
2) $f(x)=x^2-4;a=2;b=4$	
3) $f(x)=3-x^2;a=-1;b=1$	
4) $f(x)=2x-x^2;a=0,b=2$	
5) $f(x)=e^x;a=0,b=2$	