5-2 Definite Integrals

Learning Objectives:

I understand how the Rectangle Approximation Method, when taken to the limit, yields a definite integral.

I can find the value of a definite integral by using Geometry.

I can evaluate a definite integral using the graphing calculator.

I understand the terminology and notation associated with integration.

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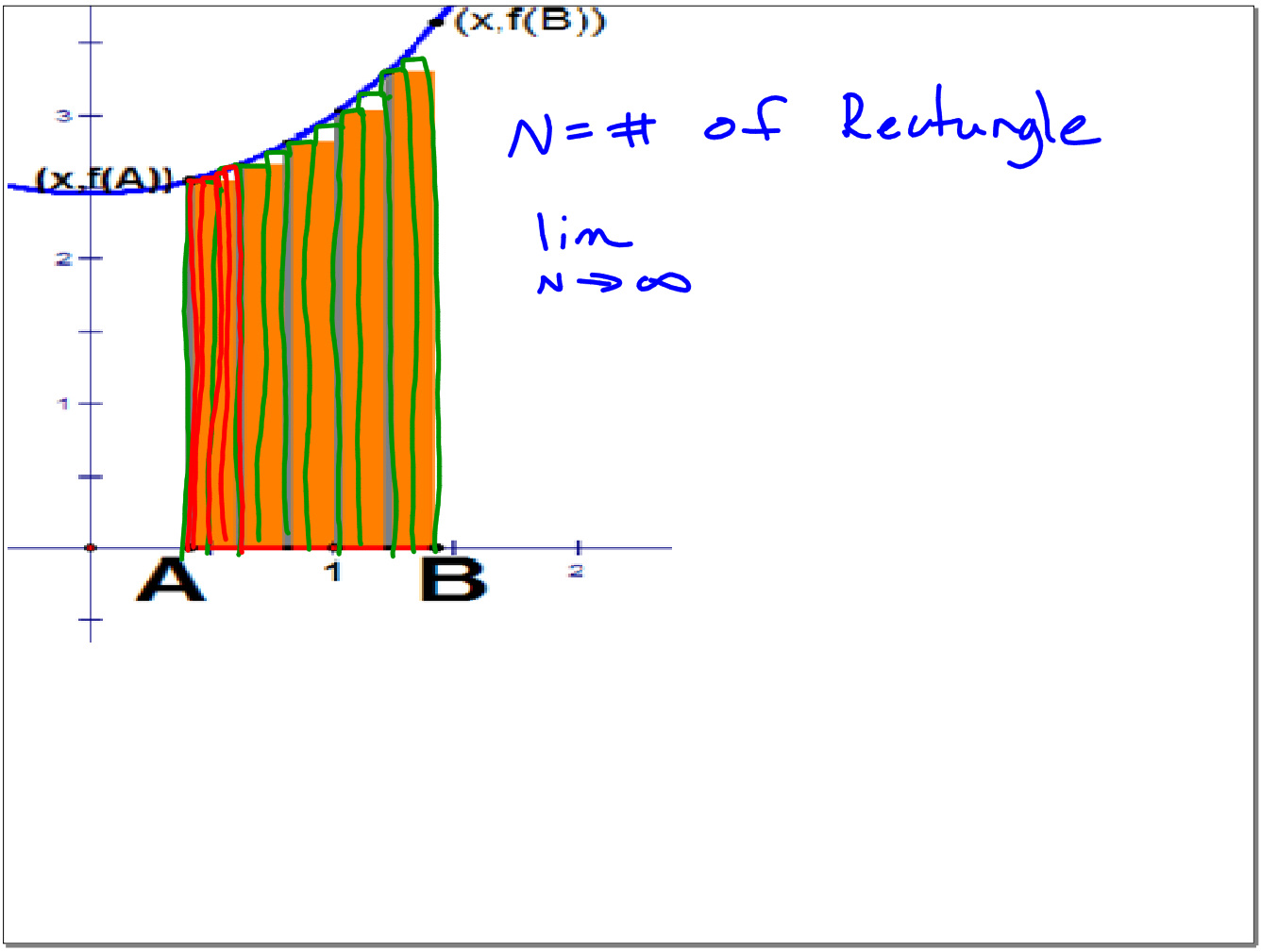

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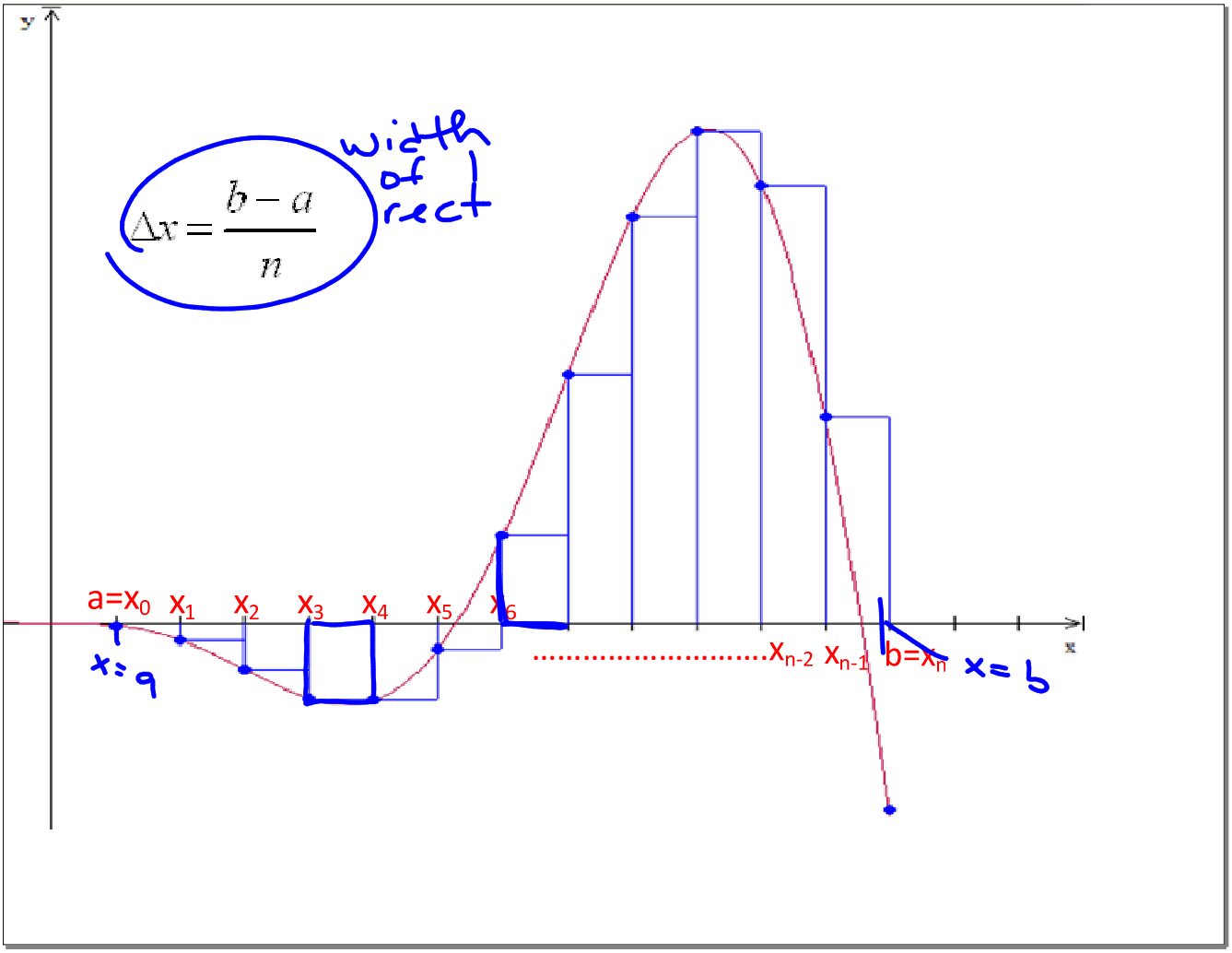
y
x
$\Delta x = \frac{b-a}{n}$
width of rect
a=x0 x1 x2 x3 x4 x5 x6
x=a
.....xn-2 xn-1 b=xn
x=b

$$Area = f(x_0)\cdot\Delta x + f(x_1)\cdot\Delta x + f(x_2)\cdot\Delta x + \ldots$$
$$\ldots + f(x_{n-2})\cdot\Delta x + f(x_{n-1})\cdot\Delta x$$

$$= \sum_{k=0}^{n-1} f(x_k)\cdot\Delta x$$

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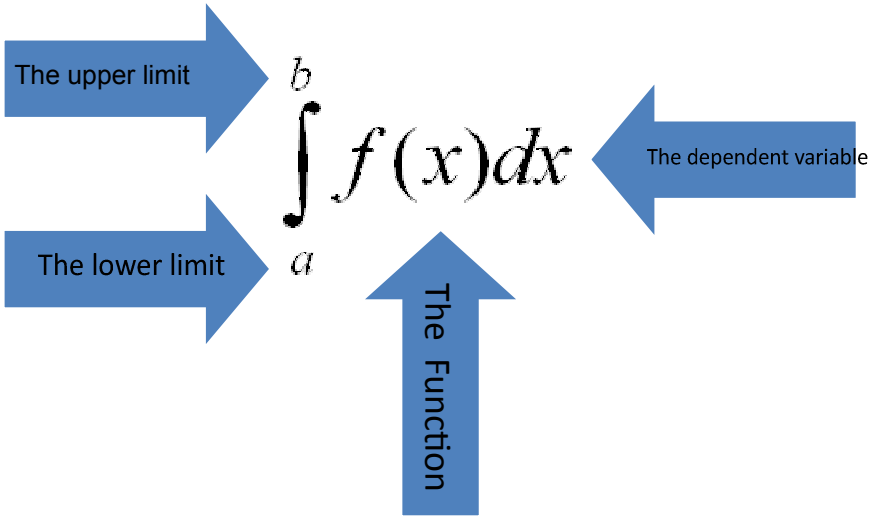
$$I = \lim_{n\to\infty} \sum_{k=0}^{n-1} f(x_k) \cdot \Delta x$$

I = Actual area between the curve and the x-axis.

$$\lim_{n\to\infty} \sum_{k=0}^{n-1} f(x_k)\,\Delta x = \int_a^b f(x)\,dx$$

Right

Left



$$\int_a^b f(x)dx$$

"The integral from a to b of f(x)"

The integral finds the area under the curve.

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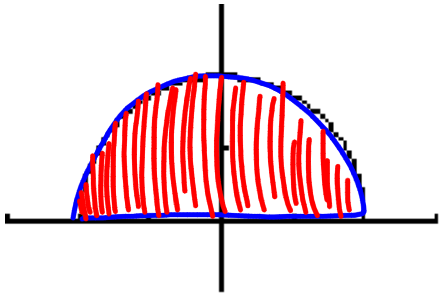
Ex1. Evaluate the integral using areas

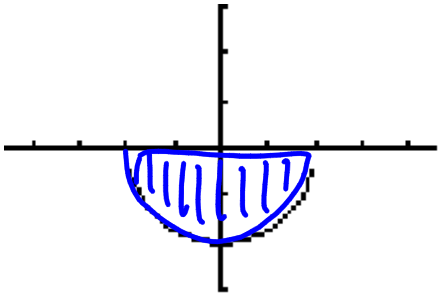
1.) $\int_{-2}^{2} \sqrt{4-x^2}\,dx$



πr^2

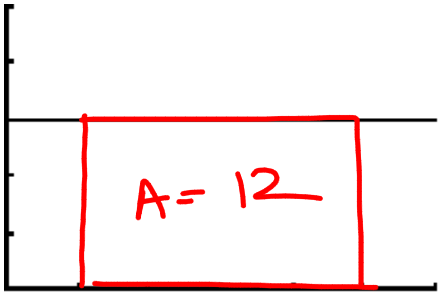
$4\pi \div 2 = \boxed{2\pi}$

2.) $\int_{-2}^{2} -\sqrt{4-x^2}\,dx$



$= \boxed{-2\pi}$

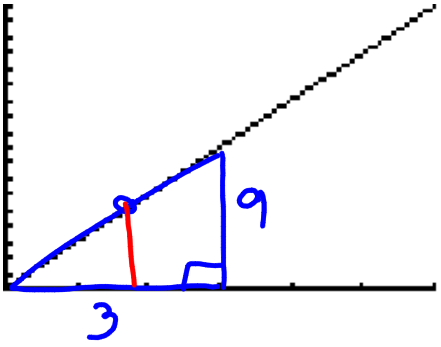
3.) $\int_1^5 3dx$



$A = 4 \cdot 3$

$A = 12$

4.) $\int_0^3 3x dx$

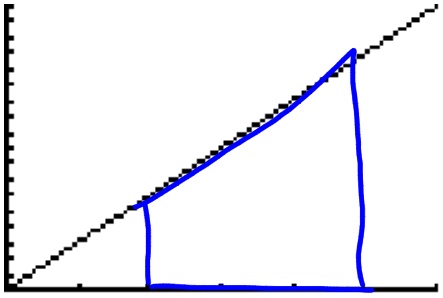


$A = \frac{1}{2} b \cdot h$

$= \frac{1}{2}(3)(9)$

$= \frac{27}{2}$

5.) $\int_2^5 3x dx$



$A = \frac{1}{2}(b_1 + b_2)h$

$= \frac{1}{2}(6 + 15) \cdot 3$

$= \frac{63}{2}$

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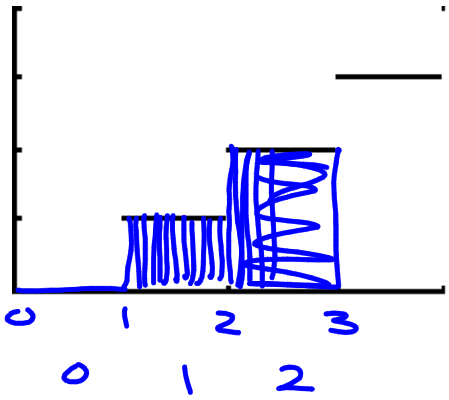
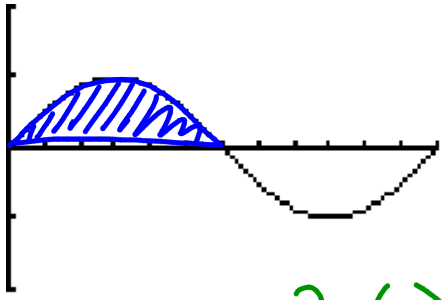
6.) $\int_0^3 [\![x]\!] \, dx$

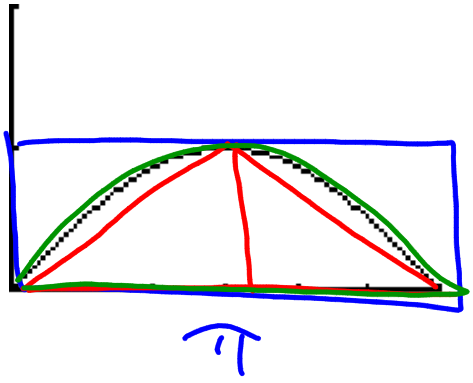


A = 3

7.) $\int_0^{\pi} \sin x \, dx$



$\frac{2}{3}(3) = 2$



1

Ex2. Work in groups to do

Exploration #1 on page 279

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Homework

Pg 282 # 7-19 odd (no GC)

33-40 (with GC)

41-44, 46

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