

## 5-2 Definite Integrals

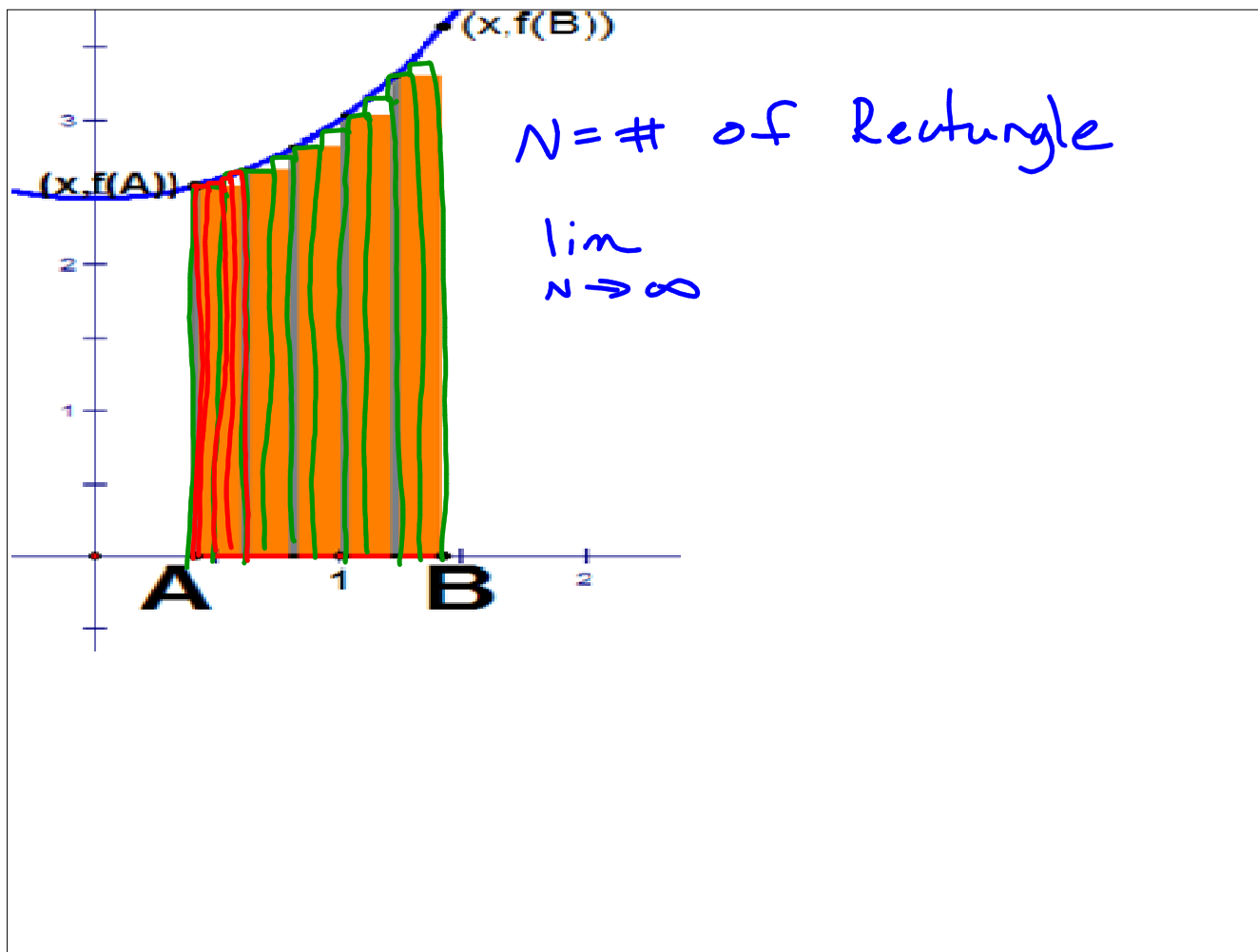
### Learning Objectives:

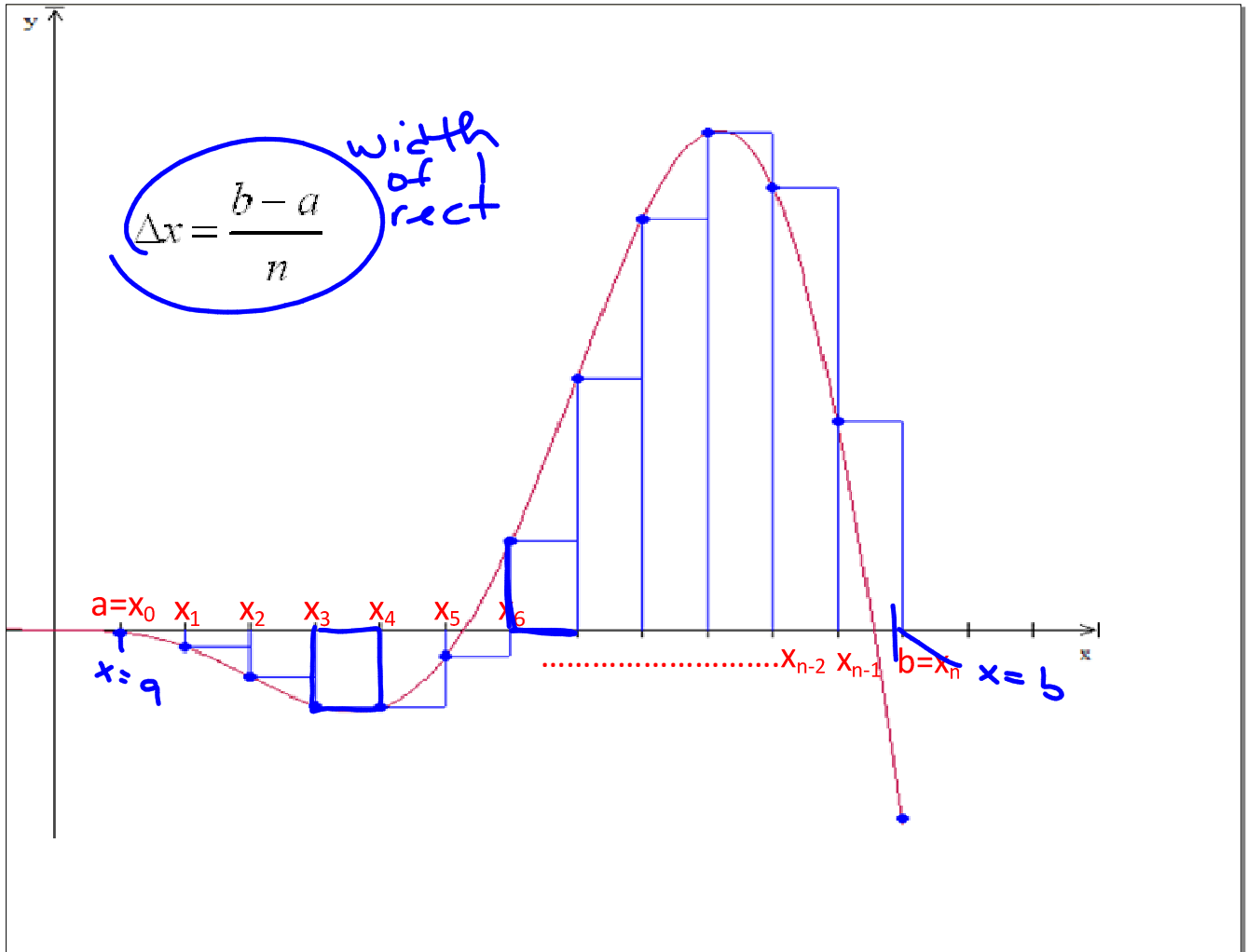
I understand how the Rectangle Approximation Method, when taken to the limit, yields a definite integral.

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.





$$\begin{aligned} \text{Area} &= f(x_0) \cdot \Delta x + f(x_1) \cdot \Delta x + f(x_2) \cdot \Delta x + \dots \\ &\dots + f(x_{n-2}) \cdot \Delta x + f(x_{n-1}) \cdot \Delta x \end{aligned}$$

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

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

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

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

Handwritten annotations:  $f(x_k)$  and  $\Delta x$  are circled in red and green respectively.  $f(x)$  and  $dx$  are circled in red and green respectively. A vertical double-headed arrow between boxes labeled  $b$  (top) and  $a$  (bottom) is shown. The word "Right" is written in blue above the arrow, and "Left" is written in blue below the arrow.

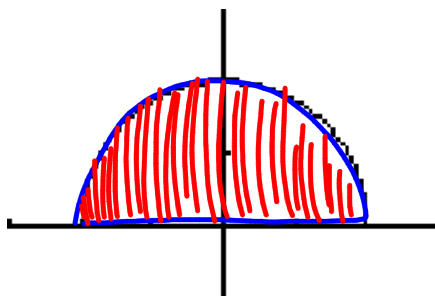
The diagram shows the integral notation  $\int_a^b f(x) dx$  with four blue arrows pointing to its parts: "The upper limit" points to  $b$ , "The lower limit" points to  $a$ , "The Function" points to  $f(x)$ , and "The dependent variable" points to  $dx$ .

“The integral from a to b of  $f(x)$ ”

The integral finds the area under the curve.

Ex1. Evaluate the integral using areas

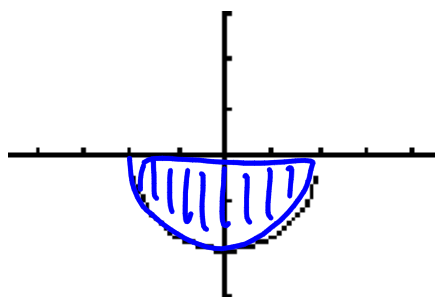
1.)  $\int_{-2}^2 \sqrt{4-x^2} dx$



$$\pi r^2$$

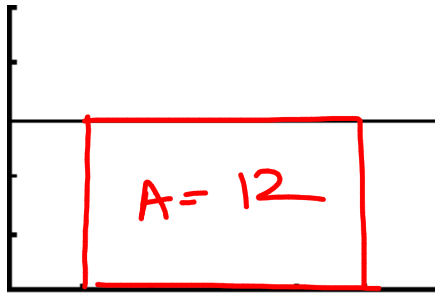
$$4\pi \div 2 = \boxed{2\pi}$$

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



$$= \boxed{-2\pi}$$

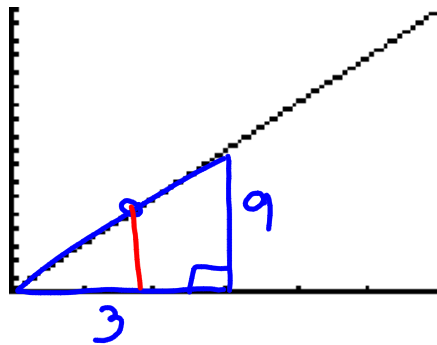
3.)  $\int_1^5 3 dx$



$$A = 4 \cdot 3$$

$$A = 12$$

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

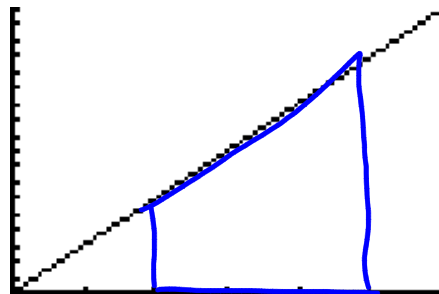


$$A = \frac{1}{2} b \cdot h$$

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

$$= \frac{27}{2}$$

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



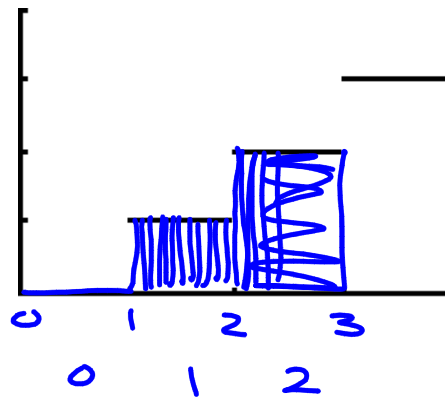
$$A = \frac{1}{2} (b_1 + b_2) h$$

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

$$= \frac{63}{2}$$

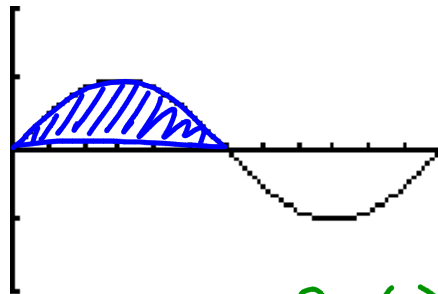


6.)  $\int_0^3 \lceil x \rceil dx$

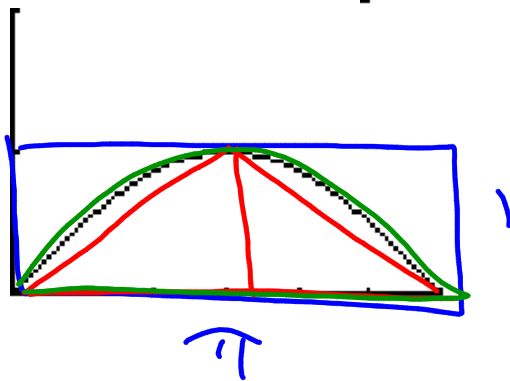


$A = 3$

7.)  $\int_0^\pi \sin x dx$



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



Ex2. Work in groups to do  
*Exploration #1* on page  
279

# Homework

Pg 282 # 7-19 odd (no GC)

33-40 (with GC)

41-44, 46