

### 6.2-6.3: The Definite Integral

#### Definitions:

partition-

$\Delta x_i$ :

$\|P\|$ :

$x_i^*$ :

A *Riemann Sum*

The **definite integral** of a function  $f$  from  $x = a$  to  $x = b$ :

(NOTE: If  $f(x) \geq 0$  on  $[a, b]$ , then the definite integral is the area under the graph from  $x = a$  to  $x = b$ ).

#### Examples:

Given  $f(x) = 4 - x^2$ , write and compute a Riemann Sum to approximate  $\int_{-1}^2 f(x) dx$  using a partition of  $P = \left\{-1, 0, \frac{1}{2}, \frac{5}{4}, 2\right\}$ . Let  $x_i^*$  = the right endpoint of each subinterval.

**Equally-spaced partitions:** Let  $n$  be the number of equally-spaced subintervals of  $[a, b]$ .  
Then  $\Delta x_i =$

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

Given  $f(x) = 4 - x^2$ , find the exact value of  $\int_{-1}^2 f(x) dx$  from the definition.

**Properties of Definite Integrals:** (pp383-385)

(NOTE: Some of the more useful properties for future sections are #2, 3, 5 and 8).

**Examples:**

Rewrite  $\int_{-3}^5 f(x) dx - \int_{-3}^0 f(x) dx + \int_5^6 f(x) dx$  as a single integral.

Compute  $\int_{-2}^2 (|x| + \sqrt{4 - x^2}) dx$