Name:		

## Notesheet. Section 6.3: Area and the Definite Integral

## Math 1210

Challenge 1. An oil company produces a constant rate of 1.2 million barrels per year. How many barrels does it produce in 4 years? How many barrels does it produce in t years?

**Theorem 2** (Area under Graph of a Function). If f is a nonnegative continuous function on [a, b], then the area A of the region under the graph is

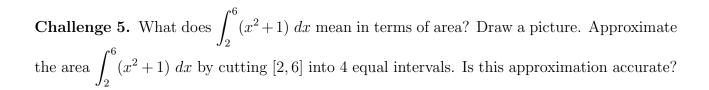
$$A = \lim_{n \to \infty}$$

where  $x_1, \ldots, x_n$  are points from the *n* subintervals of [a, b] of equal width  $\Delta x = \frac{b-a}{n}$ .

**Definition 3.** If f is a function defined on [a, b], and

exists for all choices of points  $x_1, \ldots, x_n$  in the subintervals, then this limit is the area under the curve and it is called the <u>definite integral</u> and it is denoted  $\int_a^b f(x) dx$ .

**Theorem 4.** If f is continuous on [a,b], then  $\int_a^b f(x) dx$  exists. (We say "f is <u>integrable</u> on [a,b].")



**Challenge 6.** What happens if the function dips down below the x-axis? What is the area under the curve y = 4 - x on the interval [0, 5]? Using the definition, what is  $\int_0^5 (4 - x) dx$ ?

Challenge 7. Compute  $F(x) = \int (4-x) dx$ . What is F(5) - F(0)?