Math 1552, Integral Calculus
Sections 5.2-5.3: The Definite Integral

1. (*Applying the Definite Integral*) A marketing company is trying a new campaign. The campaign lasts for three weeks, and during this time, the company finds that it gains customers as a function of time according to the formula:

$$C(t) = 5t - t^2,$$

where t is time in weeks and the number of customers is given in thousands.
Using the general form of the definite integral,

$$\int_a^b f(x)dx = \lim_{n \to \infty} \frac{b-a}{n} \sum_{i=1}^n f(x_i^*),$$

calculate the **average** number of customers gained during the three-week campaign.

2. Explain why the following property is true:

$$| \int_a^b f(x)dx| \leq \int_a^b |f(x)|dx.$$

Can you find an example where the inequality is strict?

3. Evaluate $\int_0^2 |x - 1|dx$ using integral properties from class (you may use geometry, or a Riemann Sum).