Properties of the Definite Integral

1. \( \int_{a}^{a} f(x) \, dx = 0 \)

2. \( \int_{a}^{b} f(x) \, dx = - \int_{b}^{a} f(x) \, dx \)

3. \( \int_{a}^{b} c \, dx = c(b - a) \)

4. \( \int_{a}^{b} (f(x) + g(x)) \, dx = \int_{a}^{b} f(x) \, dx + \int_{a}^{b} g(x) \, dx \)

5. \( \int_{a}^{b} c \, f(x) \, dx = c \int_{a}^{b} f(x) \, dx \)

6. \( \int_{a}^{b} f(x) \, dx \geq 0 \) for all \( a \leq x \leq b \), then \( \int_{a}^{b} f(x) \, dx \geq 0 \).

7. \( \int_{a}^{b} f(x) \, dx \geq g(x) \) for all \( a \leq x \leq b \), then \( \int_{a}^{b} f(x) \, dx \geq \int_{a}^{b} g(x) \, dx \).

8. If \( m \leq f(x) \leq M \) for all \( a \leq x \leq b \), then

\[
m(b - a) \leq \int_{a}^{b} f(x) \, dx \leq M(b - a).
\]