# Lesson 31: Definite Integrals Pt 2

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### Properties of Definite Integrals

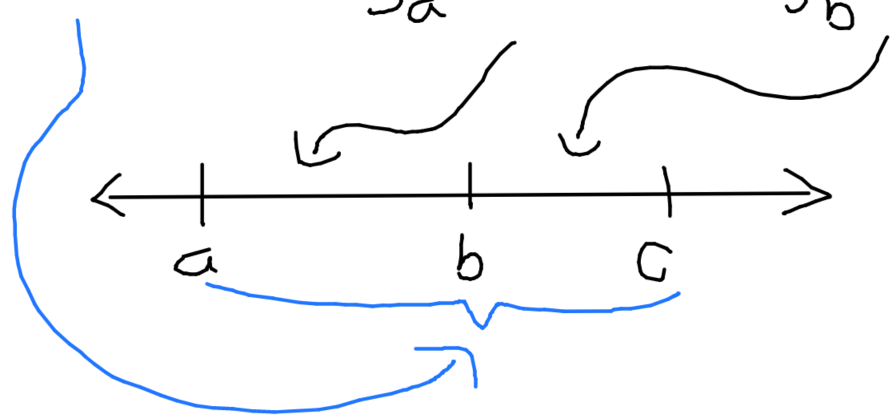
$$\int_a^a f(x)\,dx = 0$$

$$\int_a^b f(x)\,dx = -\int_b^a f(x)\,dx$$

$$\int_a^b kf(x)\,dx = k\int_a^b f(x)\,dx$$

$$\int_a^b [f(x) \pm g(x)]\,dx = \int_a^b f(x)\,dx \pm \int_a^b g(x)\,dx$$

$$\int_a^c f(x)\,dx = \int_a^b f(x)\,dx + \int_b^c f(x)\,dx$$




Ex 4: Given $\boxed{\int_1^3 f(x)\,dx = 5}$, $\int_3^4 f(x)\,dx = 2$ and $\int_1^3 g(x)\,dx = 10$. Evaluate the following

ⓐ $\int_1^3 2f(x)\,dx = 2\int_1^3 f(x)\,dx = 2(5) = 10$

Ex 4: Given $\int_1^3 f(x)dx = 5$, $\boxed{\int_3^4 f(x)dx = 2}$ and $\int_1^3 g(x)\,dx = 10$. Evaluate the following

(b) $\int_4^3 f(x)dx = -\int_3^4 f(x)dx = -2$

Ex 4: Given $\boxed{\int_1^3 f(x)dx = 5}$, $\int_3^4 f(x)dx = 2$ and $\boxed{\int_1^3 g(x)\,dx = 10}$. Evaluate the following

(c) $\int_1^3 [2f(x) - 3g(x)]\,dx$

$= 2\int_1^3 f(x)dx - 3\int_1^3 g(x)\,dx$

$= 2(5) - 3(10)$

$= 10 - 30 = -20$

Ex 4: Given $\boxed{\int_1^3 f(x)dx = 5, \int_3^4 f(x)dx = 2}$ and $\int_1^3 g(x)\,dx = 10$. Evaluate the following

(d) $\int_1^4 f(x)dx = \int_1^3 f(x)dx + \int_3^4 f(x)dx$

$= 2 + 5$

$= 7$

Ex 5: Given $\int_3^7 x^2\,dx = \frac{316}{3}$, $\int_3^7 x\,dx = 20$, and $\int_3^7 dx = 4$, evaluate

$$\int_3^7 \left[-4x^2 + x - 8\right] dx$$

$$= -4\int_3^7 x^2\,dx + \int_3^7 x\,dx - 8\int_3^7 dx$$

$$= -4\left(\frac{316}{3}\right) + 20 - 8(4) = -\frac{1300}{3}$$

HW 31.1b: Given $\int_2^6 2x^3\,dx = 640$. Find

$$\int_2^6 8x^3\,dx = \int_2^6 4(2x^3)\,dx$$

$$= 4\int_2^6 2x^3\,dx$$

$$= 4(640)$$

$$= 2560$$

HW 31.5 Given $\int_a^b g(x)dx = 5$ and $\int_a^c g(x)dx = 8\int_a^b g(x)dx$. Compute $\int_b^c g(x)dx$

Recall $\int_a^c g(x)\,dx = \int_a^b g(x)\,dx + \boxed{\int_b^c g(x)\,dx}$

Solve for the green box.

So $\int_b^c g(x)dx = \int_a^c g(x)\,dx - \int_a^b g(x)dx$

HW 31.5 Given $\int_a^b g(x)dx = 5$ and $\boxed{\int_a^c g(x)dx = 8\int_a^b g(x)dx}$ Compute $\int_b^c g(x)dx$

$$\int_b^c g(x)dx = \underbrace{\int_a^c g(x)\,dx} - \int_a^b g(x)dx$$

$$= 8\int_a^b g(x)\,dx - \int_a^b g(x)\,dx$$

$$= 7\int_a^b g(x)\,dx$$

$$= 7(5) = 35$$