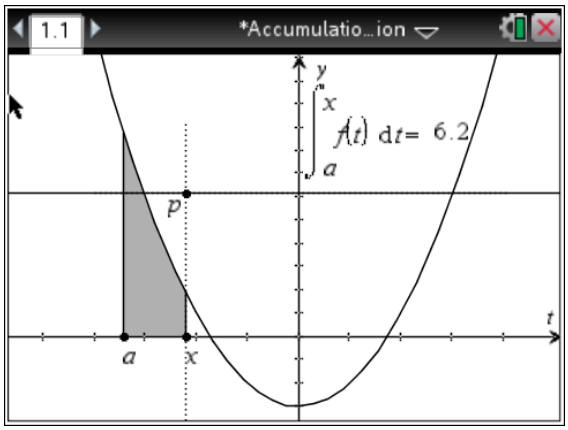
5.3 Definite Integrals and Antiderivatives

A function defined by a definite integral:

$$Area = \int_a^x f(t)\,dt$$



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Evaluate the following integrals and look for patterns:

$$\int_0^x (t)\,dt$$

$$\int_0^x (t^2)\,dt$$

$$\int_0^x (t^3)\,dt$$

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Evaluate the following integrals and look for patterns:

$$\int_a^x (t)\,dt$$

$$\int_a^x \left(t^2\right) dt$$

$$\int_a^x \left(t^3\right) dt$$

$$\int_a^x f(t)\,dt = F(x) - F(a)$$

$$F'(t) = f(t)$$

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Evaluate the following integrals by hand:

$$\int_0^{\pi} \sin(x)\,dx$$

$$\int_2^3 \left(x^3 + x - 1\right) dx$$

$$\int_0^1 \left(\frac{1}{1+x^2}\right) dx$$

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Rules for Definite Integrals

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

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

$$\int_a^b \left(f(x) \pm g(x)\right)dx = \int_a^b f(x)dx \pm \int_a^b g(x)dx$$

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

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

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

$$f_{\min}(b-a) \le \int_a^b f(x)dx \le f_{\max}(b-a)$$

if $f(x) > g(x)$ then $\int_a^b f(x) > \int_a^b g(x)$

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Ex.

$$\int_{-4}^{3} f(x)dx = 9 \qquad \int_3^5 f(x)dx = -11 \qquad \int_{-4}^{3} h(x)dx = 14$$

a. $\int_5^3 f(x)dx =$

b. $\int_{-4}^{5} f(x)dx =$

c. $\int_{-4}^{3} \left(3f(x) - 4h(x)\right)dx =$

d. $\int_3^4 f(x)dx =$

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