§4.4 Indefinite Integrals

True or **False**

If f is continuous on the interval $[a, b]$, then

$$\int_a^b f(x)\,dx$$

is a number.

Find each of the following derivatives, or specify that you don't have enough information to do so.

a) $\dfrac{d}{dx}\displaystyle\int_3^8 f(x)dx$

b) $\dfrac{d}{dx}\displaystyle\int_3^x f(t)\,dt$

c) $\dfrac{d}{dx}\displaystyle\int_x^3 f(t)\,dt$

d) $\dfrac{d}{dx}\displaystyle\int f(x)\,dx$

If $w'(t)$ is the rate of growth of a child in pounds per year, what does $\int_5^{11} w'(t)\,dt$ represent?

a) The child's initial weight at birth.

b) The decrease in the child's weight (in pounds) between the ages of 5 and 11.

c) The child's weight at age 5.

d) The increase in the child's weight (in pounds) between the ages of 5 and 11.

e) The child's weight at age 11.

The current in a wire is defined as the derivative of the charge

$$I(t) = Q'(t)$$

What does $\int_a^b I(t)\,dt$ represent?

a) It represents the change in the current I from time $t = a$ to $t = b$.

b) It represents the charge Q at time $t = b$.

c) It represents the current I at time $t = b$.

d) It represents the charge Q at time $t = a$.

e) It represents the change in the charge Q from time $t = a$ to $t = b$.

Find the general indefinite integral.

$$\int \left(8\sqrt{x^3} + 9\sqrt[3]{x^2}\right)\, dx$$

Find the particular indefinite integral of

$$\int \left(8\sqrt{x^3} + 9\sqrt[3]{x^2}\right)\, dx$$

whose value at $x = 0$ is 4.

Find the general indefinite integrals, and evaluate the definite integrals.

a) $\int 7v(v^2+8)^2\,dv$

b) $\int_0^2 (6x-3)(4x^2+9)\,dx$

c) $\int_0^2 (6x-3)(4x^2+9)\,dx$

d) $\int_9^{16} \frac{3x-3}{\sqrt{x}}\,dx$

e) $\int_1^4 \sqrt{t}\,(5+7t)\,dt$

f) $\int_{-1}^2 (x-6|x|)\,dx$

Find the indefinite integrals and evaluate the definite integrals.

a) $\int 7(1+\tan^2(\alpha))\,d\alpha$

b) $\int 5\left(\frac{\sin(2x)}{\sin(x)}\right)\,dx$

c) $\int_0^{\pi} 4\sin(\theta) - 17\cos(\theta)\,d\theta$

d) $\int_0^{\frac{\pi}{4}} \frac{2+3\cos^2(\theta)}{\cos^2(\theta)}\,d\theta$

e) $\int_0^{\frac{2\pi}{3}} \frac{7\sin(\theta)(1+\tan^2(\theta))}{\sec^2(\theta)}\,d\theta$

f) $\int_0^{\frac{3\pi}{2}} 5\,|\sin(x)|\,dx$

The velocity function (in meters per second) for a particle moving along a line is $v(t) = 3t - 8$.

a) Find the displacement.

b) Find the distance traveled from time $t = 0$ to time $t = 4$.

A particle is moving along a line so that its acceleration at time t is $a(t) = 2t + 2$ and its initial velocity is $v(0) = -3$.

a) Find the velocity at time t.

b) Find the distance traveled from time $t = 0$ to time $t = 4$.

Water flows from the bottom of a storage tank at a rate of $r(t) = 400 - 8t$ liters per minute. Find the amount of water that flows from the tank during the first 30 minutes.

Sketch the region bounded by the y-axis, the line $y = 4$, and the curve $y = 4\sqrt[4]{x}$. Find the area of this region in two ways:

a) by integrating an appropriate function of x, and

b) by writing x as a function of y and integrating with respect to y.