

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)

$$\frac{d}{dx} \int_3^8 f(x) dx$$

b)

$$\frac{d}{dx} \int_3^x f(t) dt$$

c)

$$\frac{d}{dx} \int_x^3 f(t) dt$$

d)

$$\frac{d}{dx} \int f(x) dx$$

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.

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

Find the particular indefinite integral of $\int (8\sqrt{x^3} + 9\sqrt[3]{x^2}) dx$ whose value at $x = 0$ is 4.

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

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

$$(iv) \int_9^{16} \frac{3x - 3}{\sqrt{x}} dx$$

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

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

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

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

Find the indefinite integrals and evaluate the definite integrals.

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

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

$$(ii) \int 5 \frac{\sin(2x)}{\sin(x)} dx$$

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

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

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

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:

- by integrating an appropriate function of x , and
- by writing x as a function of y and integrating with respect to y .