

3.9 - Antiderivatives

3.9a

Definition: (antiderivative)

A function F is called an antiderivative of f on an interval I if $F'(x) = f(x)$ for all x in I .

Exercise:

Find the most general antiderivative for the function.

$$f(x) = 6x^2$$

Antiderivatives and falling objects

3.9b

Antiderivatives of some trigonometric functions

The Power Rule for antidifferentiation

$$\text{If } F'(x) = x^n, \text{ then } F(x) = \frac{x^{n+1}}{n+1}$$

That is, add 1 to the exponent, and then divide by the new exponent

Exercise:

Find f .

$$f'''(t) = \sqrt{t} - 2 \cos t$$

3.9c

Exercises:

Find f .

$$f'(x) = \sec^2 x, f\left(\frac{\pi}{4}\right) = 5$$

(Note: In the above example, the information $f\left(\frac{\pi}{4}\right) = 5$ is called an initial condition.)

$$f'(x) = \frac{x+1}{\sqrt{x}}, f(1) = 5$$

$$f''(x) = 20x^3 + 12x^2 + 4, f(0) = 8, f(1) = 5$$