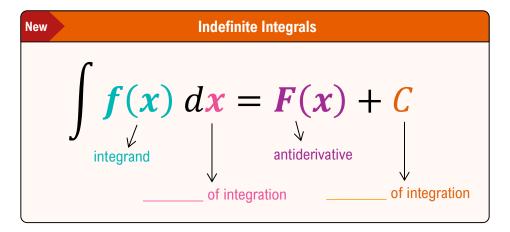
Introduction to Indefinite Integrals

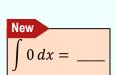
- ullet Recall: If f(x) is the derivative of a function F(x), then F(x) is an antiderivative of f(x).
 - ► Finding the indefinite integral of a function is the _____ as finding the antiderivative.

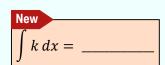


EXAMPLE

Find the indefinite integral of the following functions.

$$\int 3x^2 dx$$





◆ Just like with antiderivatives, you can check your answer to an indefinite integral by taking the derivative of it.

PRACTICE

Find the following indefinite integral.

$$\int -300 \ dx$$

PRACTICE

Find the following indefinite integral.

$$\int 4x^3 dx$$

PRACTICE

Find the following indefinite integral.

$$\int 100x^{99} dx$$

Power Rule for Indefinite Integrals

- ullet Recall: To find the **derivative** of a power fcn $f(x) = x^n$, multiply by original exponent, then decrease exponent by 1.
 - ► To find the integral of a power fcn $f(x) = x^n$, _____ exponent by 1, then _____ by the new exponent.

Reca	
$\frac{d}{d}$	$x^n = n \cdot x^{n-1}$
dx'	
Power	Rule for Derivatives

RULES OF INTEGRATION				
Name	Rule	Example		
Power	$\int x^n dx = \frac{x}{-1} + \underline{}, n \neq -1$	$\int x^6 dx = \frac{x}{} + \underline{} = \frac{x}{} + \underline{}$		

EXAMPLE

Find the indefinite integral of $g(t) = t^4$.

PRACTICE

Find h(x) by evaluating the following indefinite integral.

$$h(x) = \int x^8 \, dx$$

PRACTICE

Find h(x) by evaluating the following indefinite integral.

$$h(x) = \int x^{100} \, dx$$

PRACTICE

Find h(x) by evaluating the following indefinite integral.

$$h(x) = \int 25x^4 \, dx$$

Properties of Indefinite Integrals

◆ The same rules that apply to the sum, difference, or constant multiple of a derivative also apply to integrals.

RULES OF INTEGRATION			
Name	Rule	Example	
Sum & Difference	$\int [f(x) \pm g(x)] dx = \int f(x) dx \int g(x) dx$	$\int (x+6) dx = \int \underline{} dx + \int \underline{} dx =$	
Constant Multiple	$\int [\mathbf{k} \cdot \mathbf{f}(\mathbf{x})] d\mathbf{x} = \underline{} \cdot \int \mathbf{f}(\mathbf{x}) d\mathbf{x}$	$\int 5x^3 dx = \underline{\qquad} \cdot \int dx =$	

◆ Use *multiple* rules together to find integrals of more complicated functions.

EXAMPLE

Find the indefinite integral of $f(x) = x^2 - 3x + 6$.

PRACTICE

Find f(x) by evaluating the following indefinite integral.

$$f(x) = \int (100x^2 - 35x - \frac{13}{2})dx$$

PRACTICE

Find f(x) by evaluating the following indefinite integral.

$$f(x) = \int (8x^7 + 10x - 20)dx$$

EXAMPLE

It is determined that the marginal profit, P'(x), in hundreds of dollars per unit from selling the xth parachute is given by the function below. Find the total-profit function, P, assuming that P(0) = 0.

$$P'(x) = 0.03x - 1.5$$

EXAMPLE

The marginal revenue from a ceramics company is given by the function R'(x) in dollars per unit, from selling the xth vase. Find the total revenue function R(x) assuming that R(0) = 0.

$$R'(x) = 1.68x^2 + x + 2.5$$