The Indefinite Integral (Section 5.2)

1. As seen in the last section, $f(x) = A'(x)$. Therefore, if we are given the function (which is the derivative of the area), and we want to recover the area, we have to

____.

2. The process of finding the antiderivative is to ______________________________.

This process is also called _______________________________.

Integration Notation

$$\frac{d}{dx}[F(x)] = f(x)$$

$$\int f(x)dx = F(x) + c$$

3. **Integration Formulas**

	Differentiation Formula	Integration Formula
1	$\frac{d}{dx}[x] =$	
2	$\frac{d}{dx}\left[\frac{x^{r+1}}{r+1}\right] =$	
3	$\frac{d}{dx}[\sin x] =$	
4	$\frac{d}{dx}[-\cos x] =$	
5	$\frac{d}{dx}[\tan x] =$	
6	$\frac{d}{dx}[-\cot x] =$	
7	$\frac{d}{dx}[\sec x] =$	
8	$\frac{d}{dx}[-\csc x] =$	
9	$\frac{d}{dx}[e^x] =$	
10	$\frac{d}{dx}[\ln\lvert x\rvert] =$	

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4. **Integration of Powers**

To integrate a power of x, undo the differentiation power rule by ____________________

____.

Example 1: Evaluate

a) $\int x^2 dx$ b) $\int x^3 dx$ c) $\int \frac{1}{x^5} dx$ d) $\int \sqrt{x} dx$

Properties of Indefinite Integration

1. $\int cf(x)dx =$

2. $\int [f(x) + g(x)]dx =$

3. $\int [f(x) - g(x)] =$

Example 2: Evaluate

a) $\int 4\cos x dx$ b) $\int (x + x^2)dx$ c) $\int (3x^6 - 2x^2 + 7x + 1)dx$

Example 3: Evaluate by rewriting first

a) $\int \frac{\cos x}{\sin^2 x} dx$ b) $\int \frac{t^2 - 2t^4}{t^4} dt$

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Class Work

Find the derivative and state a corresponding integration formula.

1. $\frac{d}{dx}\left[\sqrt{x^3+5}\right]$

2. $\frac{d}{dx}\left[\frac{x}{x^2+3}\right]$

Evaluate the integral. Rewrite first if necessary.

3. $\int x^8 dx$

4. $\int x^{5/7} dx$

5. $\int x^3 \sqrt{x} dx$

6. $\int \left[5x + \frac{2}{3x^5}\right] dx$

Evaluate the integral and check your answer by differentiating.

7. $\int x(1+x^3) dx$

8. $\int (2+y^2)^2 dy$