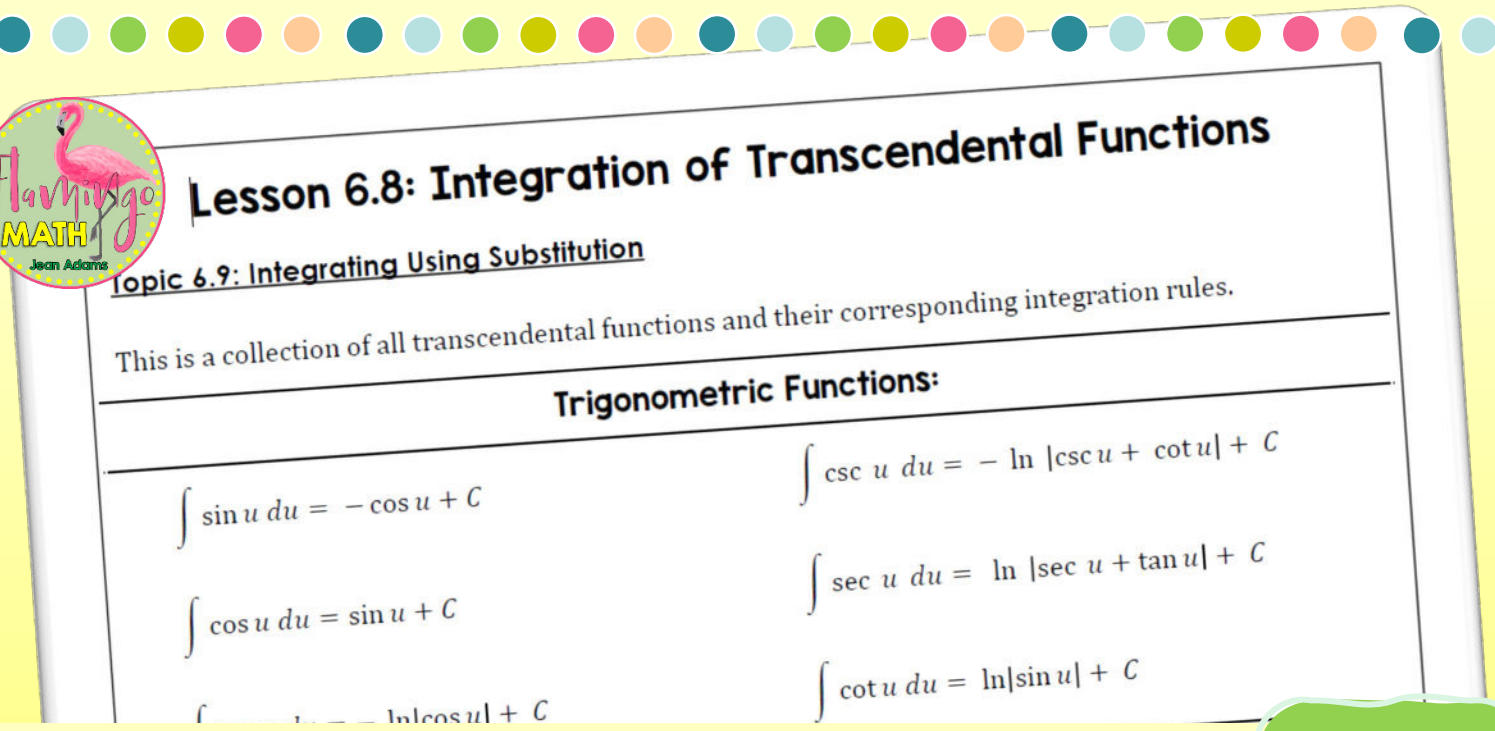
AP® Calculus

Integration

Transcendental Functions

Calculus AB Version



Lesson 6.8: Integration of Transcendental Functions

Topic 6.9: Integrating Using Substitution

This is a collection of all transcendental functions and their corresponding integration rules.

Trigonometric Functions:

$$\int \sin u \, du = -\cos u + C$$

$$\int \csc u \, du = -\ln|\csc u + \cot u| + C$$

$$\int \cos u \, du = \sin u + C$$

$$\int \sec u \, du = \ln|\sec u + \tan u| + C$$

$$\int \cot u \, du = \ln|\sin u| + C$$

$$\int \ln|\cos u| + C$$

Completely Editable 6.8

Lesson 6.8: Integration of Transcendental Functions

Topic 6.9: Integrating Using Substitution

This is a collection of all transcendental functions and their corresponding integration rules.

Trigonometric Functions:

$\int \sin u \, du = -\cos u + C$

$\int \csc u \, du = -\ln|\csc u + \cot u| + C$

$\int \cos u \, du = \sin u + C$

$\int \sec u \, du = \ln|\sec u + \tan u| + C$

$\int \tan u \, du = -\ln|\cos u| + C$

$\int \cot u \, du = \ln|\sin u| + C$

Logarithmic and Exponential Functions:

Let u be a differentiable function of x.

$\int e^u \, du = e^u + C$

$\int \frac{du}{u} = \ln|u| + C$

$\int a^u \, du = \left(\frac{a^u}{\ln a}\right) + C$

Inverse Trigonometric Functions:

$\int \frac{du}{\sqrt{a^2 - u^2}} = \arcsin\left(\frac{u}{a}\right) + C$

$\int \frac{du}{a^2 + u^2} = \frac{1}{a}$

Trigonom

There are times you might need to rewrite or re

$\sin^2 x + \cos^2 x = 1$ $\quad 1 + \tan^2 x =$

$\cos 2x = 2\cos^2 x - 1$ can als

$\cos 2x = 1 - 2\sin^2 x$ can als

$\sin 2x =$

EX #1: Find the following:

A. $\int \frac{1}{x \ln x^3} \, dx$

B. $\int \frac{\sin\theta}{2 - 3\cos\theta} \, d\theta$

C. $\int \frac{\cos t}{1 + \sin t} \, dt$

D. $\int x^2 e^{\frac{x^3}{2}} \, dx$

F. $\int 2^{\sin x} \cos x \, dx$

G. $\int \frac{dx}{5 + 4x^2}$

H. $\int \frac{\sin^{-1} x}{\sqrt{1 - x^2}} \, dx$

EX #2: Find the definite integral:

A. $\int_0^{\pi/2} \frac{1 - \sin x}{x + \cos x} \, dx$

B. $\int_1^3 e^{2-x} \, dx$

C. $\int_1^3 \frac{e^{\frac{3}{x}}}{x^2} \, dx$

D.

E. $\int_0^1 x \, 5^{x^2} \, dx$

EX #3: Evaluate by completing the square.

A. $\int \frac{dx}{x^2 + 12x + 37}$

B. $\int \frac{dx}{\sqrt{4x - x^2}}$

EX #4: Change of Variables Challenge

A. $\int \frac{1}{1 + \sqrt{2x}} \, dx$

B. $\int_0^4 \frac{5}{3x + 1} \, dx$

NOTES

Lesson 6.8: Integration of Transcendental Functions

Topic 6.9: Integrating Using Substitution

This is a collection of all transcendental functions and their corresponding integration rules.

Trigonometric Functions:

$\int \sin u \, du = -\cos u + C$

$\int \csc u \, du = -\ln|\csc u + \cot u| + C$

$\int \cos u \, du = \sin u + C$

$\int \sec u \, du = \ln|\sec u + \tan u| + C$

$\int \tan u \, du = -\ln|\cos u| + C$

$\int \cot u \, du = \ln|\sin u| + C$

Logarithmic and Exponential Functions:

Let u be a differentiable function of x.

$\int e^u \, du = e^u + C$

$\int \frac{du}{u} = \ln|u| + C$

$\int a^u \, du = \left(\frac{a^u}{\ln a}\right) + C$

Inverse Trigon

$\int \frac{du}{\sqrt{a^2 - u^2}} = \arcsin\left(\frac{u}{a}\right) + C$

$\int \frac{du}{a^2 + u^2} = \frac{1}{a}$

Trigonome

There are times you might need to rewrite or re

$\sin^2 x + \cos^2 x = 1$ $\quad 1 + \tan^2 x =$

$\cos 2x = 2\cos^2 x - 1$ can also

$\cos 2x = 1 - 2\sin^2 x$ can also

$\sin 2x =$

EX #1: Find the following:

A. $\int \frac{1}{x \ln x^3} \, dx$

B. $\int \frac{\sin\theta}{2 - 3\cos\theta} \, d\theta$

C. $\int \frac{\cos t}{1 + \sin t} \, dt$

D. $\int x^2 e^{\frac{x^3}{2}} \, dx$

F. $\int 2^{\sin x} \cos x \, dx$

G. $\int \frac{dx}{5 + 4x^2}$

H. $\int \frac{\sin^{-1} x}{\sqrt{1 - x^2}} \, dx$

EX #2: Find the definite integral:

A. $\int_0^{\pi/2} \frac{1 - \sin x}{x + \cos x} \, dx$

B. $\int_1^3 e^{2-x} \, dx$

C. $\int_1^3 \frac{e^{\frac{3}{x}}}{x^2} \, dx$

D.

E. $\int_0^1 x \, 5^{x^2} \, dx$

EX #3: Evaluate by completing the square.

A. $\int \frac{dx}{x^2 + 12x + 37}$

B. $\int \frac{dx}{\sqrt{4x - x^2}}$

EX #4: Change of Variables Challenge

A. $\int \frac{1}{1 + \sqrt{2x}} \, dx$

B. $\int_0^4 \frac{5}{3x + 1} \, dx$

Practice Sets

6.8 Integration of Transcendental Functions
Form A

Name _____

Date _____ Period _____

1. Find the indefinite integral:

$$\int e^{\tan(3\theta)} \sec^2(3\theta)\, d\theta$$

2. Find the indefinite integral:

$$\int \frac{1}{\sqrt{1-9x^2}}\, dx$$

3. Evaluate:

$$\int_{-2}^{2} 4^{\frac{x}{2}}\, dx$$

6.8 Integration of Transcendental Functions
Form B

Name _____

Date _____ Period _____

1. Find the indefinite integral:

$$\int e^{\cos(\pi\theta)} \sin(\pi\theta)\, d\theta$$

2. Find the indefinite integral:

$$\int \frac{2x}{\sqrt{1-x^4}}\, dx$$

3. Evalua

$$\int_{-1}^{1} 4^{-}$$

6.8 Integration of Transcendental Functions
Form C

Name _____

Date _____ Period _____

1. Find the indefinite integral:

$$\int e^{\cot(\pi\theta)} \csc^2(\pi\theta)\, d\theta$$

2. Find the indefinite integral:

$$\int \frac{1}{1+4x^2}\, dx$$

3. Evaluate:

$$\int_{-1}^{1} 4^{2x}\, dx$$

6.8 Integration of Transcendental Functions
Form D

Name _____

Date _____ Period _____

1. Find the indefinite integral:

$$\int e^{\sin(3\theta)} \cos(3\theta)\, d\theta$$

2. Find the indefinite integral:

$$\int \frac{1}{\sqrt{1-4x^2}}\, dx$$

3. Evaluate:

$$\int^{2} 2^{\frac{x}{2}}\, dx$$

Daily Lesson Quiz