

Integration - Trigonometric Functions

Date _____ Period _____

Evaluate each indefinite integral.

$$1) \int \cos x \, dx$$
$$\sin x + C$$

$$2) \int -5\sin x \, dx$$
$$5\cos x + C$$

$$3) \int 3 \cdot \sec^2 x \, dx$$
$$3\tan x + C$$

$$4) \int -3\csc x \cdot \cot x \, dx$$
$$3\csc x + C$$

$$5) \int \frac{2}{\sec x} \, dx$$
$$2\sin x + C$$

$$6) \int \frac{5}{\csc x} \, dx$$
$$-5\cos x + C$$

$$7) \int -4\tan x \, dx$$
$$-4\ln |\sec x| + C$$

$$8) \int -\cot x \, dx$$
$$-\ln |\sin x| + C$$

Differentiation - Logs and Exponentials

Date _____ Period _____

Differentiate each function with respect to x .

1) $y = 4^{4x^4}$

$$\begin{aligned}\frac{dy}{dx} &= 4^{4x^4} \ln 4 \cdot 16x^3 \\ &= x^3 \cdot 4^{4x^4+2} \ln 4\end{aligned}$$

2) $y = 4^{-5x^2}$

$$\begin{aligned}\frac{dy}{dx} &= 4^{-5x^2} \ln 4 \cdot -15x^2 \\ &= -\frac{15x^2 \ln 4}{4^{5x^2}}\end{aligned}$$

3) $y = \log_3 3x^2$

$$\begin{aligned}\frac{dy}{dx} &= \frac{1}{3x^2 \ln 3} \cdot 6x \\ &= \frac{2}{x \ln 3}\end{aligned}$$

4) $y = \log_2 4x^2$

$$\begin{aligned}\frac{dy}{dx} &= \frac{1}{4x^2 \ln 2} \cdot 8x \\ &= \frac{2}{x \ln 2}\end{aligned}$$

5) $y = \log_3 (3x^5 + 5)^5$

$$\begin{aligned}\frac{dy}{dx} &= \frac{1}{(3x^5 + 5)^5 \ln 3} \cdot 5(3x^5 + 5)^4 \cdot 15x^4 \\ &= \frac{75x^4}{\ln 3 \cdot (3x^5 + 5)}\end{aligned}$$

6) $y = \log_5 (-5x^3 - 2)^3$

$$\begin{aligned}\frac{dy}{dx} &= \frac{1}{(-5x^3 - 2)^3 \ln 5} \cdot 3(-5x^3 - 2)^2 \cdot -15x^2 \\ &= -\frac{45x^2}{\ln 5 \cdot (-5x^3 - 2)}\end{aligned}$$

7) $y = (4^{x^2} + 2)^3$

$$\begin{aligned}\frac{dy}{dx} &= 3(4^{x^2} + 2)^2 \cdot 4^{x^2} \ln 4 \cdot 2x \\ &= 9x^2(4^{x^2} + 2)^2 \cdot 4^{x^2} \ln 4\end{aligned}$$

8) $y = 3^{(x^4+1)^2}$

$$\begin{aligned}\frac{dy}{dx} &= 3^{(x^4+1)^2} \ln 3 \cdot 2(x^4+1) \cdot 4x^3 \\ &= 4x^3 \cdot 3^{(x^4+1)^2+1} \cdot (x^4+1)^2 \ln 3\end{aligned}$$

9) $y = 3^{\cos 3x^4}$

$$\begin{aligned}\frac{dy}{dx} &= 3^{\cos 3x^4} \ln 3 \cdot -1 \sin 3x^4 \cdot 12x^3 \\ &= -4x^3 \cdot 3^{\cos 3x^4+1} \sin 3x^4 \cdot \ln 3\end{aligned}$$

10) $y = \log_5 \tan 4x^4$

$$\begin{aligned}\frac{dy}{dx} &= \frac{1}{\tan 4x^4 \cdot \ln 5} \cdot \sec^2 4x^4 \cdot 16x^3 \\ &= \frac{16x^3 \cdot \sec^2 4x^4}{\tan 4x^4 \cdot \ln 5}\end{aligned}$$