When you are done with your homework you should be able to...

π Use the Log Rule for Integration to integrate a rational function

π Integrate trigonometric functions

Warm-up:

1. Differentiate the following functions with respect to x.

a. $y = x \ln 5x$

b. $\ln(xy) = \ln(x + y)$.

THEOREM: LOG RULE FOR INTEGRATION

Let u be a differentiable function of x.

1. $\int \dfrac{1}{x} dx = \ln|x| + C$

2. $\int \dfrac{1}{u} dx = \ln|u| + C$

Example 1: Find or evaluate the integral.

a. $\int \dfrac{10}{x} dx$

b. $\int \dfrac{x^2}{\sqrt{5 - x^3}} dx$

c. $\int \dfrac{x}{\sqrt{1 - x^2}} dx$

d. $\displaystyle\int_{e}^{e^2} \frac{dx}{x \ln x}$

e. $\displaystyle\int_{1}^{e} \frac{\left(1+\ln x\right)^2 dx}{x}$

f. $\displaystyle\int \frac{1}{x^{2/3}\left(1+x^{1/3}\right)} dx$

g. $\displaystyle\int \frac{x^3 - 6x - 20}{x+5}\,dx$

h. $\displaystyle\int \tan\theta\,d\theta$

i. $\int \cot \theta \, d\theta$

j. $\int \sec \theta \, d\theta$

k. $\int \csc \theta \, d\theta$

INTEGRALS OF THE SIX BASIC TRIGONOMETRIC FUNCTIONS

$$\int \sin u \, du = \underline{\hspace{3cm}} \qquad \int \cos u \, du = \underline{\hspace{3cm}}$$

$$\int \tan u \, du = \underline{\hspace{3cm}} \qquad \int \cot u \, du = \underline{\hspace{3cm}}$$

$$\int \sec u \, du = \underline{\hspace{3cm}} \qquad \int \csc u \, du = \underline{\hspace{3cm}}$$

Example 2: Solve the differential equation.

a. $y' = \dfrac{x+1}{x-1}$

b. $r' = \theta \tan \theta^2$

Example 3: The demand equation for a product is $p = \dfrac{90{,}000}{400+3x}$. Find the average price on the interval $40 \le x \le 50$.