FORMULA

$\sinh^{-1}(x) = ?$

$\ln\left(x + \sqrt{x^2+1}\right)$

FORMULA

$\cosh^{-1}(x) = ?$

$\ln\left(x + \sqrt{x^2-1}\right)$

FORMULA

Double Angle Formula Involving $\cos^2(x)$

$$\cos^2(x) = \frac{1}{2}\left(1 + \cos(2x)\right)$$

(Useful for trig-sub problems!)

FORMULA

Double Angle Formula Involving $\sin^2(x)$

$$\sin^2(x) = \frac{1}{2}\left(1 - \cos(2x)\right)$$

(Useful for trig-sub problems!)

Indefinite Integral

$$\int \ln(x)\,dx = ?$$

$$x\ln(x) - x + C$$

Formula

Area Between Two Curves

$$A = \int_a^b |f(x) - g(x)|\,dx$$

where

$$|f(x)-g(x)| = \begin{cases} f(x) - g(x) & \text{when } f(x) \geq g(x) \\ g(x) - f(x) & \text{when } g(x) \geq f(x) \end{cases}.$$

Formula

Volume of Revolution Formula

If you are rotating about a line parallel to the x-axis...

$$V = \int_a^b A(x)\,dx$$

or if you are rotating about a line parallel to the y-axis...

$$V = \int_a^b A(y)\,dy$$

where both $A(x)$ and $A(y)$ equal

$$\pi(\text{outer radius})^2 - \pi(\text{inner radius})^2$$

Formula

Average Value of a Function

The average value of a function $f(x)$ over an interval $[a, b]$ is

$$f_{\text{ave}} = \frac{1}{b-a}\int_a^b f(x)\,dx$$

FORMULA

Work

$$W = \int_a^b f(x)\,dx$$

where $f(x)$ is a function representing *force* with respect to distance.

FORMULA

Integration by Parts

$$\int f(x)g'(x)\,dx = f(x)g(x) - \int g(x)f'(x)\,dx$$

or equivalently, if $u = f(x)$ and $v = g(x)$, then

$$\int u\,dv = uv - \int v\,du$$

Also,

$$\int_a^b f(x)g'(x)\;dx = f(x)g(x)]_a^b - \int_a^b g(x)f'(x)\;dx$$

FORMULA

Arclength of a Function

$$L = \int_a^b \sqrt{1 + [f'(x)]^2}\,dx$$

TRIG-SUB TRICK

If you see $b^2x^2 + a^2$ in an integrand...

Try setting

$$x = \frac{a}{b}\tan(\theta), \quad dx = \frac{a}{b}\sec^2(\theta)d\theta$$

and use

$$1 + \tan^2(\theta) = \sec^2(\theta)$$

to simplify.

Trig-Sub Trick

If you see $b^2x^2 - a^2$ in an integrand...

Try setting

$$x = \frac{a}{b}\sec(\theta), \quad dx = \frac{a}{b}\sec(\theta)\tan(\theta)d\theta$$

and use

$$\sec^2(\theta) - 1 = \tan^2(\theta)$$

to simplify.

Trig-Sub Trick

If you see $a^2 - b^2x^2$ in an integrand...

Try setting

$$x = \frac{a}{b}\sin(\theta), \quad dx = \frac{a}{b}\cos(\theta)d\theta$$

and use

$$1 - \sin^2(\theta) = \cos^2(\theta)$$

to simplify.

Indefinite Integral

$$\int \frac{dx}{x^2 + a^2} = ?$$

$$\frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C$$

Thank You

I Had A Great Time Being Your TA This Year!

Have a safe and restful holiday!!!