$uv - \int v\,du$

Use tabular integration to integrate the following

10. $\int x^2 \ln x\,dx$ =

| $\ln x$ | $x^2\,dx$ |
|---|---|
| $\frac{1}{x}$ | $\frac{1}{3}x^3$ |

$= \frac{1}{3}x^3 \ln x - \int \frac{1}{x} \cdot \frac{x^3}{3}\,dx$

$= \frac{1}{3}x^3 \ln x - \frac{1}{3}\int x^2$

$= \frac{1}{3}x^3 \ln x - \frac{1}{9}x^3 + C$

Use ultra violet minus super vdu to integrate the following

10. $\int x^2 \ln x\,dx$

Use tabular integration to integrate the following

A. $\int \arcsin(x)\,dx$

$\frac{1}{\sqrt{1-x^2}}$ → $x$

$= x\arcsin x - \int \frac{x}{\sqrt{1-x^2}}$

$= x\arcsin x - \int x(1-x^2)^{-1/2}$

$= x\arcsin x + \frac{1}{2}\cdot 2(1-x^2)^{1/2} + C$

19. $\int e^x \cos(2x)\,dx$

$$\int \frac{x^3}{\sqrt{1+x^2}}\,dx = \int x^3 (1+x^2)^{-1/2}\,dx$$

$$= \int \underbrace{x^2}_{\to 2x} \cdot \underbrace{x(1+x^2)^{-1/2}\,dx}_{\to \frac{1}{2}\cdot 2(1+x^2)^{1/2}}$$

$$= x^2(1+x^2)^{1/2} - \int 2x(1+x^2)^{1/2}$$

$$= x^2(1+x^2)^{1/2} - \frac{2}{3}(1+x^2)^{3/2} + C$$

## Tabular

$$\int x \sin(x)\,dx = -x\cos x + \int \cos x$$

| | |
|---|---|
| $x$ | $\sin(x)$ |
| $1$ | $-\cos x$ |

$= -x\cos x + \sin x + C$

## Guess/Check or u-substitution

$$\int x \sin(x^2)\,dx = -\frac{1}{2}\cos(x^2) + C$$

$$\int x e^x\,dx$$

$$\int x e^{x^2}\,dx = \frac{1}{2}e^{x^2} + C$$

What you'll Learn About

- How integrate a fraction when the denominator can be factored and the numerator is not the derivative of the denominator

$2x-4 = 2(x-2)$

What x values make the denominator equal to zero?

$x=0 \quad x=4$

(1) Factor Denominator
(2) Find A and B
(3) Rewrite Fractions and Take Antiderivative
(4) Properties of Logarithms

A) $\int \frac{x-12}{x^2-4x}dx$

$\int \frac{x-12}{x(x-4)} = \int \frac{3}{x} + \frac{-2}{x-4} = 3\ln x - 2\ln(x-4) + C$

$\ln x^3 - \ln(x-4)^2 + C$

$\ln\left|\frac{x^3}{(x-4)^2}\right| + C$

$\frac{x-12}{x(x-4)} = \frac{A}{x} + \frac{B}{x-4}$

$\frac{x-12}{x(x-4)} = \frac{A(x-4)}{x(x-4)} + \frac{Bx}{x(x-4)}$

$x-12 = A(x-4) + Bx$

$x=0 \quad -12 = -4A \quad 3 = A$

$x=4 \quad -8 = 4B \quad -2 = B$

B) $\int \frac{16-x}{x^2+3x-10}dx = \int \frac{-3}{x+5} + \frac{2}{x-2} = -3\ln(x+5) + 2\ln(x-2)$

$\int \frac{16-x}{(x+5)(x-2)}$

$\ln\left|(x+5)^{-3}\right| + \ln(x-2)^2$

$\frac{16-x}{(x+5)(x-2)} = \frac{A}{x+5} + \frac{B}{x-2}$

$\ln\left|(x+5)^{-3}(x-2)^2\right| + C$

$16-x = A(x-2) + B(x+5)$

$\ln\left|\frac{(x-2)^2}{(x+5)^3}\right| + C$

$x=2 \quad 14 = 7B \quad 2 = B$

$x=-5 \quad 21 = -7A \quad -3 = A$