

What you'll Learn About

- How to integrate a product by recognizing that one of the pieces contains the derivative of the other

18) $\int x \cos(2x^2) dx$ $u = 2x^2$ $\frac{du}{dx} = 4x$ $\frac{du}{4x} = dx$

$\int x \cos(2x^2) dx = \frac{1}{4} \sin(2x^2) + C$

$x \cos(u) dx$

$\int x \cos(u) \frac{du}{4x} = \frac{1}{4} \int \cos(u) du = \frac{1}{4} \sin(u) + C$
 $= \frac{1}{4} \sin(2x^2) + C$

$\int \frac{dx}{x^2+9} = \frac{1}{3} \arctan\left(\frac{x}{3}\right) + C$

21) $\int \frac{dx}{x^2+9}$ $u = \frac{x}{3}$ $u = \frac{1}{3}x$ $\frac{du}{dx} = \frac{1}{3}$
 $3du = dx$

$\int \frac{1}{x^2+9} dx$

$\int \frac{1}{(3u)^2+9} \cdot 3du = 3 \int \frac{1}{9u^2+9} du = 3 \int \frac{1}{9(u^2+1)} du = \frac{3}{9} \int \frac{1}{u^2+1} du$
 $= \frac{1}{3} \arctan(u) + C$

24) $\int 8(x^4+4x^2+1)^2 (x^3+2x) dx$ $u = x^4+4x^2+1$

$8 \cdot \frac{1}{4} \cdot \frac{1}{3} (x^4+4x^2+1)^3 + C$

$\checkmark (x^4+4x^2+1)^2 (4x^3+8x)$

$$u = x + 2$$

$$\frac{du}{dx} = 1$$

$$\int u^5 du$$

$$\frac{1}{6} u^6 + C$$

$$\frac{1}{6} (x+2)^6 + C$$

$$u = 1 + x^2$$

$$A) \int (x+2)^5 dx = \frac{1}{6} (x+2)^6 + C$$

$$B) \int \sqrt{4x-1} dx$$

$$\int (4x-1)^{1/2} dx$$

$$\frac{1}{4} \cdot \frac{2}{3} (4x-1)^{3/2} + C$$

$$C) \int 2x \sqrt{1+x^2} dx$$

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

$$\checkmark (1+x^2)^{1/2} \cdot 2x$$

$$D) \int 3x^2 (x^3+1)^{1/3} dx$$

$$\int 3x^2 (x^3+1)^{1/3} dx$$

$$\frac{3}{4} (x^3+1)^{4/3} + C$$

$$\checkmark (x^3+1)^{1/3} \cdot 3x^2$$

$$D) \int (2-3t^2) \sqrt{2t^3-4t+8} dx$$

$$\int (2-3t^2) (2t^3-4t+8)^{1/2} dx$$

$$-\frac{1}{2} \cdot \frac{2}{3} (2t^3-4t+8)^{3/2} + C$$

$$\checkmark (2t^3-4t+8)^{1/2} \cdot (6t^2-4)$$

$$E) \int \frac{(5\sqrt{x}+2)^2}{\sqrt{x}} dx$$

$$\int x^{-1/2} (5x^{1/2}+2)^2 dx$$

$$\frac{2}{5} \cdot \frac{1}{3} (5x^{1/2}+2)^3 + C$$

$$\checkmark \frac{2}{5} (5x^{1/2}+2)^2 \cdot \frac{5}{2} x^{-1/2}$$

$$\left[2(t^3-2t+4) \right]^{1/2}$$