

Worksheet: 5.5 Substitution

Check that the following are correct by taking the derivative of the right hand side of the equation.

1. $\int \sin(x^3+1)x^2 dx = -\cos(x^3+1)+C$

2. $\int [\sin(x)]^{-3} \cos(x) dx = \frac{1}{-2}[\sin(x)]^{-2}+C$

In each of the computations you did above, what was the "inside" function that you used in the chain rule?

1. _____

2. _____

Calculate the following integrals, using substitution.

1. $\int \sin(x^3 + 1)x^2 dx$

Let $u = x^3 + 1$. Then $du =$ _____, so $dx =$ _____.

2. $\int [\sin(x)]^{-3} \cos(x) dx$

Let $u = \sin(x)$. Then $du =$ _____, so $dx =$ _____.

3. $\int (x^5 - 12)^{10} x^4 dx$

Let $u = x^5 - 12$. Then $du =$ _____, so $dx =$ _____.

4. $\int \frac{1}{x \ln(x)} dx$

Let $u = \ln(x)$. Then $du =$ _____, so $dx =$ _____.

$$\int x^2(x^3 + 5)^9 dx$$

$$\int \cos(2 - x) dx$$

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

$$\int \frac{x}{x^2+5} dx$$

$$\int \cos(\theta) \sin^2(\theta) d\theta$$

$$\int e^{\sin(x)} \cos(x) dx$$

$$\int \frac{e^t}{1+e^t} dt$$

$$\int \frac{\cos(\pi/x)}{x^2} dx$$

$$\int (1 + \tan(x))^5 \sec^2(x) dx$$

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

Tip: Split this one into the sum of two integrals.

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

Tip: Let $u = x^2$.

$$\int \frac{x}{1+x^4} dx$$

Tip: If $u = x + 2$, then $x = u - 2$.

$$\int \frac{x}{\sqrt[4]{x+2}} dx$$

Tip: If $u = 1 - x$, then $x = 1 - u$.

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