Integration by Substitutions (4A)

Young Won Lim
6/30/14

Please send corrections (or suggestions) to youngwlim@hotmail.com.

This document was produced by using OpenOffice and Octave.

Chain Rule

$$f\left(g(x)\right) \rightarrow \frac{d}{dx} \rightarrow f'\left(g(x)\right) \cdot g'(x)$$

$$\frac{df}{dx} = \frac{df}{dg} \cdot \frac{dg}{dx}$$

$$\frac{df}{dg} = f'(g) \qquad \frac{dg}{dx} = g'(x)$$

$$f\left(\square\right) \rightarrow \frac{d}{dx} \rightarrow f'\left(\square\right) \cdot \square'$$

Substitution Rule

$$f(g(x)) + C \Leftarrow \int \cdot\, dx \Leftarrow f'(g(x)) \cdot g'(x)$$

$$f(g(x)) + C = \int f'(g(x)) \cdot g'(x)\, dx$$

$$f(u) + C = \int f'(u) \cdot du$$

$$\int f'(g(x)) \cdot g'(x)\, dx = \int f'(g(x)) \cdot \frac{dg}{dx} dx$$

$$= \int f'(u)\, du$$

$$= f(u) + C$$

$$u = g(x)$$

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

Chain Rule and Substitution Rule

$$f(g(x)) \quad \Rightarrow \boxed{\frac{d}{dx}} \Rightarrow \quad f'(g(x)) \cdot g'(x)$$

$$\frac{df}{dx} = \frac{df}{dg} \cdot \frac{dg}{dx}$$

$$f(g(x)) + C \quad \Leftarrow \boxed{\int \cdot \, dx} \Leftarrow \quad f'(g(x)) \cdot g'(x)$$

$$f(g(x)) + C = \int f'(g(x)) \cdot g'(x) \, dx$$

Substitution Rule

$$f(g(x)) + C \Leftarrow \int \cdot\, dx \Leftarrow f'(g(x)) \cdot g'(x)$$

$$f(g(x)) + C = \int f'(g(x)) \cdot g'(x)\, dx$$

$$f(x) + C = \int f'(x)\, dx$$

$$F(g(x)) + C \Leftarrow \int \cdot\, dx \Leftarrow f(g(x)) \cdot g'(x)$$

$$F(g(x)) + C = \int f(g(x)) \cdot g'(x)\, dx$$

$$F(x) + C = \int f(x)\, dx$$

References

[1] http://en.wikipedia.org/
[2] M.L. Boas, “Mathematical Methods in the Physical Sciences”
[3] E. Kreyszig, “Advanced Engineering Mathematics”
[4] D. G. Zill, W. S. Wright, “Advanced Engineering Mathematics”