$$\int f(g(x))g'(x)dx \xrightarrow[\text{using integration by substitution}]{} \int f(u)du \rightarrow F(x)+C$$

Steps for Intergration by Substitution

1. Let $u = g(x)$. (Usually the "inside function")

2. Find the derivative of u : $\dfrac{du}{dx} = g'(x)$.

3. Solve for dx : $dx = \dfrac{du}{g'(x)}$.

4. Replace the original integrand with the substitutions:

$$g(x) = u$$

$$dx = \frac{du}{g'(x)}$$

5. Evaluate the resulting integrand.

6. Replace u by $g(x)$ to obtain the final solution as a function of x.