Integration by Substitution Method

Kind of an Integral "Chain Rule" or reverse "Chain Rule"
Sometimes also referred to as "Change of Variables"

BIG IDEA: Look for some expression in the integrand whose derivative, or very close to the derivative also appears in the integrand. That embedded function is usually chosen to be $u(x)$.

$$\int f(x)dx = \int g\big(u(x)\big)\cdot u'(x)dx$$

Choose $u(x)$

Then $u'(x) = \dfrac{du}{dx}$

So, $u'(x)dx = du$

NEW INTEGRAL

$$\int f(x)dx = \int g(u)du$$

Then find the antiderivative of the simpler integral and lastly substitute $u(x)$ back into the answer.