General Indefinite Integral Forms

(1) $\int [f(x)]^n f'(x)\,dx =$

(2) $\int e^{f(x)} f'(x)\,dx =$

(3) $\int \frac{1}{f(x)} f'(x)\,dx =$

Example 5.2.1. *Find each indefinite integral.*

a) $\int (2x^3 - 3)^{20}(6x^2)\,dx$

b) $\int e^{5x}(5)\,dx$

c) $\int \frac{1}{4+x^2}\ 2x\,dx$

Definition 5.2.1. *The* _____ *of* $y = f(x)$ *is*

Example 5.2.2. *Find the differential* dy *for* $y = f(x) = e^{-5x}$.

Steps for Integration by Subsitution

(1) Select a substitution that appears to simplify the integrand. In particular, try to select u so that its differential (up to a constant) appears in the integral.

(2) Express the integrand entirely in terms of u and du, completely eliminating the original variable and its differential.

(3) Evaluate the new integral, if possible.

(4) Express the antiderivative, found in step 3, in terms of the original variable.

Example 5.2.3. *Find* $\int (x^2 - 3x + 7)^4 (2x - 3)\, dx$ *by substitution.*

Example 5.2.4. $\int e^{-3x}\,dx$

Example 5.2.5. $\int e^{-x}(1-e^{-x})^4\,dx$

Example 5.2.6. $\int \frac{x}{x^2-9}\,dx$

Example 5.2.7. $\int x\sqrt{x+1}\,dx$

Example 5.2.8. *The marginal price $p'(x)$ at a supply level of x tubes per week for a certain brand of toothpaste is given by $p'(x) = 0.001e^{0.01x}$. Find the price-supply equation if the supplier is willing to supply 100 tubes per week at a price of* 1.65 *each. How many tubes would the supplier be willing to supply at a price of* 1.98 *each?*