

6.2. INTEGRATION BY SUBSTITUTION

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 6.2.1. 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 6.2.1. The _____ of $y = f(x)$ is

Example 6.2.2. Find the differential dy for $y = f(x) = e^{-5x}$.

Steps for Integration by Substitution

- (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 6.2.3. Find $\int (x^2 - 3x + 7)^4 (2x - 3) dx$ by substitution.

Example 6.2.4. $\int e^{-3x} dx$

Example 6.2.5. $\int \frac{x}{x^2-9} dx$

Example 6.2.6. $\int x\sqrt{x+1} dx$

Example 6.2.7. *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?*

Homework: 6.5 p. # work e-grade practice at least 2 times.