Section 5.2 Integration by Substitution

# Topic 1: Reversing the Chain Rule

**General Indefinite Integral Formulas**

For , a constant, the following formulas are true.

1. ,
2. 
3. 

# Topic 2: Integration by Substitution

If defines a differentiable function, then

1. The **differential **** of the independent variable *x* is an arbitrary real number.
2. The **differential **** of the dependent variable *y* is defined as the product of and : .

**Formulas: General Indefinite Integral Formulas**

For , a constant, the following formulas are true:

1. , 
2. 
3. , 

These formulas are valid if *u* is an independent variable or if *u* is a function of another variable and  is the differential of *u* with respect to that variable.

**Procedure**: **Integration by Substitution**

1. Select a substitution that appears to simplify the integrand. In particular, try to select *u* so that  is a factor in the integrand.
2. Express the integrand entirely in terms of *u* and , completely eliminating the original variable and its differential.
3. Evaluate the new integral if possible.
4. Express the antiderivative found in the previous step in terms of the original variable.

# Topic 3: Additional Substitution Techniques

In order to use the substitution method, the integrand must be expressed entirely in terms of *u* and . In some cases, the integrand must be modified before making a substitution and using one of the integration formulas.

# Topic 4: Applications