# **Summary of Integration by Substitution**

## **Steps to integration by substitution:**

**Example 1:** Consider

1. Let u equal the expression inside the parenthesis.

Solution: **u =**

1. Find du. Solution: **du = 2x dx**
2. Substitute. Solution:

 **u du**

1. Take the antiderivative of u. Solution:
2. Substitute .

Final Solution:

**Example 2:** Consider

1. Let u equal the expression inside the exponent. Solution: **u =**
2. Find du. Solution: **du = 2x dx**
3. We need to be able to substitute something in for 3x dx. But du = 2x dx. So use algebra to get the right side of #2 to equal 3x dx.

 so

1. Substitute. Solution:

1. Take the antiderivative of . Solution:
2. Substitute .

Final Solution:

Example 3**:** Consider

1. Let u equal Solution: **u =**
2. Find du. Solution: **du = 2x dx**
3. We need to be able to substitute something in for 4x dx. But du = 2x dx. So use algebra to get the right side of #2 to equal 4x dx.

 so

1. Substitute.

Solution:  **=**

 **2 du sin(u)**

1. Take the antiderivative of sin(u). Solution:
2. Substitute .

Final Solution:

Example 4**:** Consider

1. Let u equal Solution: **u =**
2. Find du. Solution: **du = dx =**
3. We need to be able to substitute something in for dx. But du = dx.

1. Substitute.

Solution:

 **du u**

1. Take the antiderivative of u.

Solution:

1. Substitute .

Final Solution:

## Practice Problems:

**Find the Indefinite Integral using substitution:**

1.

## **Solutions:**

1. + C