**Math 201**

**Section 5.3** Integration by Substitution

Method of u-Substitution:

Suppose $F(x)$ is an antiderivative of $f(x)$ and we wish to evaluate

$$\int f(g(x))g'(x)dx.$$

By letting $u = g(x)$ we see that $du = g'(x)dx$ and we make the substitution in the integral

$$\int f(u)du.$$

Since $F$ is an antiderivative of $f$,

$$\int f(u)du = F(u) + C.$$

Substituting back, $u = g(x)$, we have

$$\int f(g(x))g'(x)dx = \int f(u)du = F(u) + C = F(g(x)) + C.$$