Section 5.5

I. Differentiation: Chain Rule
   A. Examples

II. Integration by Substitution: Reverse the Effects of the Chain Rule
   A. Theorem Let \( f(x) = g(u(x))u'(x) \) and let \( G \) be an anti-derivative of \( g \). Then,

\[
\int f(x) \, dx = \int g(u(x))u'(x) \, dx = \int G'(u(x))u'(x) \, dx = \int (G(u(x)))' \, dx = G(u(x)) + C
\]

Note: \( \int g(u(x))u'(x) \, dx = \int g(u) \, du = \int G'(u) \, du = G(u) + C = G(u(x)) + C \)

III. Examples
   A. Indefinite Integrals
   B. Definite Integrals
      1. Change of Limits