MATH 16020 Lesson 1A: Integration by Substitution I

Spring 2021

Warm-up. Find the derivative of $2(3x+4)^{10}$.

Idea behind substitution:

Example 1. Evaluate: $\displaystyle\int x^2\sqrt{31-5x^3}\,dx$

Example 2. Evaluate: $\displaystyle\int e^{x+e^x}\,dx$

Example 3. Find the function $f(x)$ whose tangent line has the slope $\tan(x)$ for x in the domain of $\tan(x)$ whose graph passes through the point $(2\pi, 6)$.

Example 4. Suppose a microwave heats a brownie in such a way that the temperature of the brownie increases at a rate of:

$$T'(t) = 54t^2 e^{-3t^3} \text{ °F/min}$$

If the brownie has temperature $30°F$ going into the microwave, how long should the microwave heat the brownie so the brownie has temperature $33°F$? Round answer to nearest hundreth.