Math 250 – Notes: Sect. 4.5 – Integration by Substitution (part 2)

I. Integration by Substitution with DEFINITE INTEGRALS

Integration by process involves a *change of variables*. What is the effect of this on the **bounds** of a definite integral?

-example-   Evaluate: $\displaystyle\int_0^8 \sqrt{3x+1}\,dx$

Method 1: Change of bounds

Method 2:

-example-   Evaluate: $\displaystyle\int_1^5 \frac{1}{\sqrt{2x-1}}\,dx$

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-example- Evaluate: $\displaystyle\int_{0}^{\pi/3} \frac{\sin x}{\cos^3 x}\,dx$

II. Differential Equations

-example- Solve the differential equation $\dfrac{dy}{dx} = (3x-1)^5$ given that $y\,(0) = 3$.

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-example -   Solve the differential equation $\dfrac{dy}{dx} = x\sin(x^2)$ given that $y(0) = 1$.

Other applications:

-example- Find the **average value** of the function $y = \dfrac{x}{\sqrt{x^2+1}}$ on the interval $[1, 4]$