6 – The 3-Step Process to Writing Solutions on Exams | Mathematics: Calculus

NOTE* When you are writing a solution, you are writing an English essay with universal quantifiers—that is, a condensed symbolic representation of words.

Step 0: The Question or **Title of the Essay**

$$\text{Find } \frac{dy}{dx} \text{ provided, } \qquad y = \int_{\sin x}^{\cos x} \sin^3 t \, dt.$$

Step 1: The Formulae or **Introduction** 50% Credit (1/2 the credit comes from this part.)

For the first step, you write out the related formula(s).

Fundamental Theorem of Calculus I of II (for single variable)

$$y = \int_{u(x)}^{v(x)} f(t)\, dt \;\Rightarrow\; \frac{dy}{dx} = f(v)v' - f(u)u'.$$

Step 2: Solution or **The Body of the Essay** 0% → 50% Credit (This is where you lose points.)

Execute the formula.

$$y = \int_{\sin x}^{\cos x} \sin^3 t \, dt \;\Rightarrow\; \frac{d}{dx}\left[y = \int_{\sin x}^{\cos x} \sin^3 t \, dt\right]$$

$$\Rightarrow\; y' = (\sin^3 \cos x)\left(\frac{d}{dx}\cos x\right) - (\sin^3 \sin x)\left(\frac{d}{dx}\sin x\right)$$

$$\Rightarrow\; y' = (\sin^3 \cos x)(-\sin x) - (\sin^3 \sin x)(\cos x).$$

Stop here ↑ unless <u>specifically told to simplify</u>

Note* Students go from A's to B's or B's to C's all the time because they continue simplifying when they don't need to and then lose points. Don't lose unnecessary points!

Step 3: The Answer or **Summary** 0% Credit

$$\boxed{\text{Therefore, } y' = (\sin^3 \cos x)(-\sin x) - (\sin^3 \sin x)(\cos x).}$$

NOTE: It is essential to structure your solution step-by-step, for if you make a mistake, you will lose the fewest number of points this way.