Homework #8

Two Routes, One Answer

One integral, two methods and one common mistake.

Sheldon Dantas
Faculty of Electrical Engineering, Czech Technical University in Prague

Calculus 1 – Winter term 2026–2027

The task

Work in a group of exactly five students and consider

$$F(x) = \int_0^{x^2} (t + 1)\, dt.$$

Prepare one video of at most three minutes in which your group:

1. finds $F'(x)$ directly using the Fundamental Theorem and the chain rule;
2. evaluates the integral first and differentiates the resulting formula;
3. verifies that the two methods give the same answer;
4. finds the tangent line to $y = F(x)$ at $x = 1$;
5. explains the mistake in the claim $F'(x) = x^2 + 1$.

All five students must speak.

Two routes

Your video must clearly separate the two methods.

Route A: differentiate first

- Keep the integral unevaluated.
- Apply the Fundamental Theorem.
- Remember that the upper limit is x^2, not x.

Route B: integrate first

- Find an antiderivative of $t + 1$.
- Evaluate it between 0 and x^2.
- Differentiate the resulting function of x.

The two routes must be shown independently before the answers are compared.

What to submit

Submit one video file or one accessible video link for the whole group.

Before submitting, check that the video contains:

- the names of all five students;
- both complete methods;
- the tangent line at $x = 1$;
- a precise explanation of the missing chain-rule factor;
- participation by all five students;
- a duration of at most three minutes.

Send it to sheldon.dantas@gmail.com