Quiz # 08
Math 101-Section 05 Calculus I
16 November 2023 Thursday
Instructor: Ali Sinan Sertöz
Solution Key

Bilkent University

Q-1) Evaluate $\int \left(\dfrac{\sin x^3}{x^2} \right) \left(3\cos x^3 - \dfrac{2\sin x^3}{x^3} \right) \, dx$.

Hint: First note that the integrand is of the form $f(x)\,f'(x)$ and then use the Fundamental Theorem of Calculus Part 2. (This question is inspired by Exercise 61 on page 360 of your book.)   Grading: 10 points

Solution: (Grader: `rburakguler71@gmal.com`)

Let $f(x) = \dfrac{\sin x^3}{x^2}$ and $F(x) = \frac{1}{2}f(x)^2$. Then $F'(x) = f(x)\,f'(x)$.

Thus the given integral is of the form $\int F'(x)\, dx = F(x) + C$ for some constant C.

Finally
$$\int \left(\frac{\sin x^3}{x^2} \right) \left(3\cos x^3 - \frac{2\sin x^3}{x^3} \right) \, dx = \frac{1}{2}\left(\frac{\sin x^3}{x^2} \right)^2 + C,$$
for some constant C.