

Math 102 — Integral basics

Problem 1. For each of the following functions $f(x)$, find all possible antiderivatives $F(x)$ of $f(x)$. That is, find all functions $F(x)$ so that $F'(x) = f(x)$.

- a. $f(x) = 5x - \sqrt{x} + \frac{1}{x^4}$
- b. $f(x) = x^4 + \frac{1}{x}$
- c. $f(x) = 2 + \cos x$

Problem 2. Find the following using antiderivatives and the Fundamental Theorem of Calculus.

- a. $\int_0^5 (x^3 - x^2 + 10x) dx$
- b. $\int_0^{\pi/4} \sin \theta d\theta$
- c. $\int_0^1 4e^z dz$
- d. $\int_1^2 \frac{1+y^2}{y} dy$

Problem 3. Suppose that $G(x)$ is an antiderivative of $g(x)$, and $G(4) = 9, G(6) = 4, G(9) = 6$. Find the following integrals.

- a. $\int_4^6 g(x) dx + \int_6^9 g(x) dx$
- b. $\int_4^9 (g(x) + 3) dx$
- c. $\int_6^9 7g(x) dx$