

MAT1575 Module 3 – An algorithm for applying the Fundamental Theorem of Calculus, Part 2.

Objectives: Construct an algorithm for computing $\int_a^b f(x) dx$ for any polynomial. Implement the algorithm in python using trinket.io.

1. State the Fundamental Theorem of Calculus, Part 2.
2. State the integral power rule for x^n where n is a nonnegative integer.
3. Compute $\int_a^b x^n dx$ in terms of a , b and n .
4. Construct an algorithm for computing $\int_a^b f(x) dx$ for any polynomial $f(x) = a_dx^d + a_{d-1}x^{d-1} + \cdots + a_1x + a_0$ using your answers to questions 2 and 3. (Hint: Think about a for loop that applies your results from questions 2 and 3 to every monomial term in the polynomial.)
5. Implement your algorithm in python using trinket.io. A basic skeleton of the algorithm appears here: <https://trinket.io/python/44ee93dd37>
6. Test your algorithm against the following examples:
 - (a) Compute the area under $f(x) = 3x^3 + x^2 + x + 5$ from $x = 2$ to $x = 7$.
 - (b) Compute the area under $f(x) = -2x^4 + 4x - 9$ from $x = -2$ to $x = 3$.
 - (c) Compute the area under $f(x) = \frac{2}{3}x^2 + 3x$ from $x = 0$ to $x = 2$.
 - (d) Compute the area under $f(x) = 8x^2 - 4$ from $x = -1$ to $x = 1$.