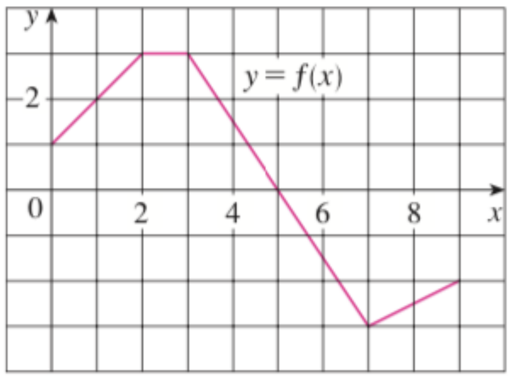
Lab worksheet for Tuesday, 9 March 2021

Practice: Integration and the Fundamental Theorem of Calculus

Exercise 1: The graph of f is shown. Evaluate each integral by interpreting it in terms of areas.

a) $\int_0^2 f(x)dx.$ b) $\int_0^5 f(x)dx.$

c) $\int_5^7 f(x)dx.$ b) $\int_0^9 f(x)dx.$



Exercise 2: Let f(x) = x – 1. Find the area of f(x) along the interval [0, 3] by two methods: use the geometry and the fundamental theorem of calculus.

Exercise 3: Let $f(x) = x^2$. Find the area of f(x) along the interval [0,1].

Note: In the 3rd century B.C, Archimedes was able to calculate this area, which he called area of a parabolic segment by using mechanical and exhaustion methods. Therefore, some historians considered Archimedes as the person who gave birth to the calculus, which Newton and Leibniz brought to perfection in the later 17th century.

Exercise 4: Let $f(x) = sin\ x$. Find the area of f(x) along the interval $[0,2\pi]$ by using the fundamental theorem of calculus. Justify your answer by using the symmetry of the graph of f(x).

Exercise 5: Find an antiderivative of the following functions:

a) $f(x) = 5.$

b) $f(x) = 3x$.

c) $f(x) = x^3$.

d) $f(x) = x^n$. $(n \neq -1)$

e) $f(x) = \frac{1}{x}$.

f) $f(x) = e^x$.

g) $f(x) = sinx$

h) $f(x) = cosx$

Exercise 6: Find $\int_0^1 \sqrt{1 - x^2} dx$.