Class 08: Accumulated Change: Numbers and Graphs

Calculus II

College of the Atlantic. January 26, 2023

1. Let $r(t)$ be the rate, in people per minute, at which people arrive at the dining hall for dinner, where t is measured in minutes past 5:30. Consider the following integral:

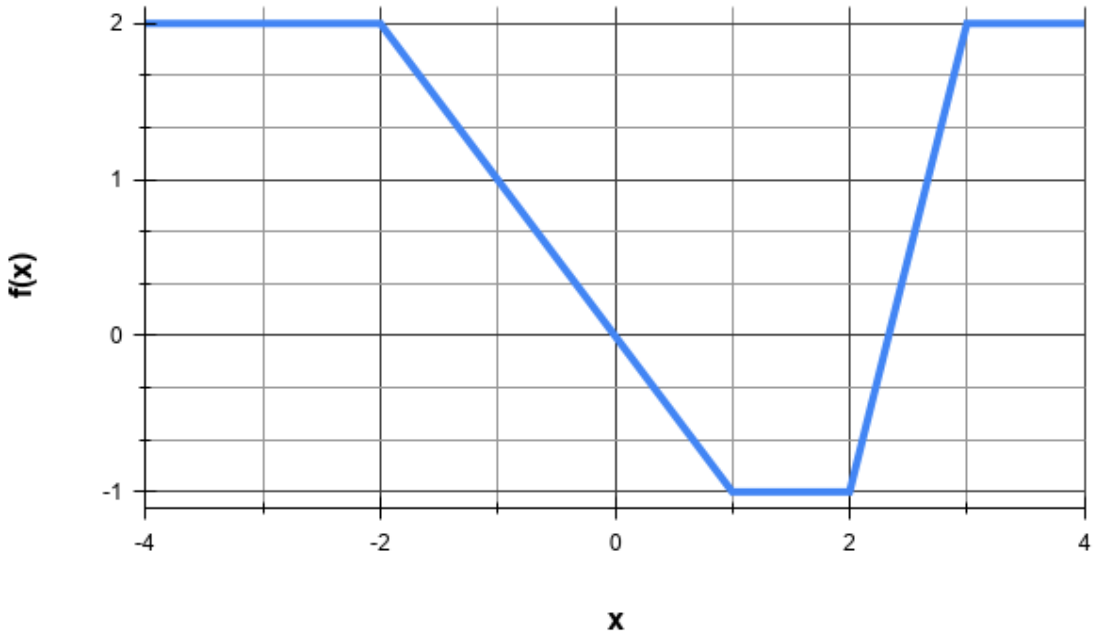
$$\int_0^{30} r(t)\,dt\,. \tag{1}$$

   (a) What are the units of the above integral?

   (b) What is the practical interpretation of the above integral?

   (c) What are the units of $\frac{dr}{dt}$?

   (d) What is the practical interpretation of $\frac{dr}{dt}$?



2. A function $f(x)$ is shown above. Note the location of the vertical zero axis. Use the graph to determine values of the following:

   (a) $\int_{-4}^{-2} f(x)\,dx$

   (b) $\int_{-2}^{0} f(x)\,dx$

   (c) $\int_{-4}^{0} f(x)\,dx$

   (d) $\int_{0}^{2} f(x)\,dx$

   (e) $\int_{2}^{3} f(x)\,dx$

3. On a weird Maine day, the temperature is described by the following function: $T(t) = 25 + \frac{1}{4}t^2$, where time t is measured in hours since midnight. What is the average temperature that day – i.e. over the next 24 hours.

4. What is the average value of the function $a(t) = \sqrt{4 - t^2}$ from $t = 0$ to $t = 2$? Draw this average value on a graph.

5. What is the average value of $f(x)$ from $x = -2$ to $x = 2$?

6. What is the average value of $g(x) = \cos(x)$ from $x = 0$ to $x = 2\pi$?

7. What is the average value of $h(x) = 1 + \cos(x)$ from $x = 0$ to $x = 2\pi$?