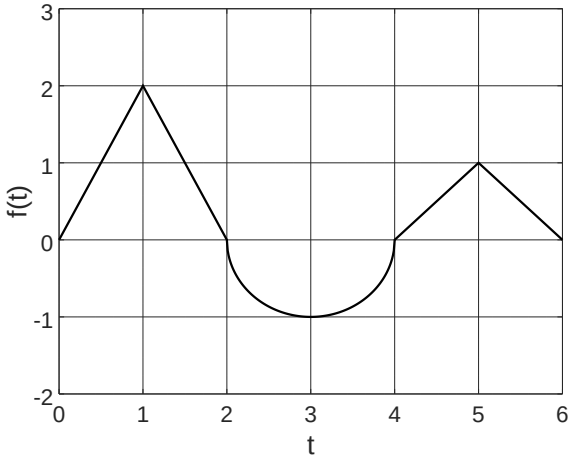
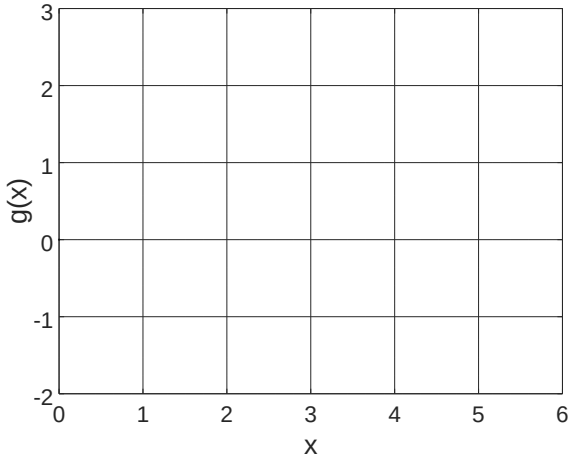
1. (a) The graph of $f(t)$ is at right. Suppose we define the new function

$$g(x) = \int_0^x f(t)\,dt$$

Assuming the lines are straight and the curved part is circular, what are the exact values of $g(0), g(2), g(4), g(6)$?



(b) Sketch the graph of $g(x)$ on the provided axes.



(c) What is the graph of $g'(x)$?

2. (a) Use part I of the Fundamental Theorem of Calculus, and the chain rule, to find dy/dx if

$$y = \int_{\cos x}^{\pi} \theta^2\,d\theta$$

(b) Use part II of the Fundamental Theorem of Calculus to find $y = y(x)$. Then differentiate to find dy/dx . . . and get the same result as in (a).

3. Evaluate the integral and interpret as a difference of areas:

$$\int_{\pi/6}^{3\pi/2} \cos x \, dx =$$

4. Evaluate the integral:

$$\int_{1/\sqrt{3}}^{\sqrt{3}} \frac{8}{1+x^2} \, dx =$$

5. Evaluate the integral:

$$\int_0^1 (1+r)^3 \, dr =$$

6. Suppose we define a function:

$$f(x) = \begin{cases} \sin x & \text{if } 0 \leq x \leq \pi/2 \\ \cos x & \text{if } \pi/2 < x \leq \pi \end{cases}$$

Evaluate the integral $\int_0^\pi f(x) \, dx$.