

1) Given the function  $f(x) = \cos(\pi x)$ . Determine an *upper estimate* for the area under the graph of  $f$ , for  $0 \leq x \leq \frac{1}{2}$ , by using three rectangles.

2) Compute  $\int_0^2 [\sin^2(\pi x) + \sqrt{4 - x^2}] dx$ .

3) Compute  $\int_{-1}^1 \frac{dx}{\sqrt{15 - 2x - x^2}}$ .

4) Given a function  $f$  and a number  $a$  such that

$$6 + \int_a^x \frac{f(t)}{t^2} dt = 2\sqrt{x} \quad \text{for all } x > 0.$$

Determine  $a + f(1)$ .

5) Given  $R$  the region bounded by:

the X-axis, the lines  $x + y - 2 = 0$ ,  $x = -1$ , and  $x = 1$ .

Determine the volume of the solid obtained by rotating  $R$  around the line  $x = -1$ .