

1. For each of the following, determine whether the approximation is an overestimate or underestimate of the exact area.

a) $f(x) = 4 - x^2$ over $[0, 2]$ using 4 right-endpoint rectangles.

b) $f(x) = 4 - x^2$ over $[0, 2]$ using 4 left-endpoint rectangles.

c) $f(x) = \sqrt{x}$ over $[0, 2]$ using 4 right-endpoint rectangles.

d) $f(x) = \sqrt{x}$ over $[0, 2]$ using 4 left-endpoint rectangles.

e) $f(x) = \cos^2 x + \sin^2 x$ over $[0, 2]$ using 4 right-endpoint rectangles.

2. The nose “cone” of a rocket is a *paraboloid* obtained by revolving the curve $y = \sqrt{x}$, $0 \leq x \leq 5$, about the x -axis, where x is measured in feet. Estimate the volume V of the nose cone by partitioning $0 \leq x \leq 5$ into five subintervals of equal length, slicing the cone with planes perpendicular to the x -axis at the subintervals’ left endpoints, constructing cylinders of height 1 based on cross sections at these points, and finding the volumes of these cylinders.

