

1. Let f and g be the functions given by $f(\mathrm{x})=\frac{1}{4}+\sin (\pi x)$ and $\mathrm{g}(\mathrm{x})=4^{-x}$. Let R be the shaded region in the first quadrant enclosed by the $y$-axis and the graphs of $f$ and $g$, and let $S$ be the shaded region in the first quadrant enclosed by the graphs of $f$ and $g$, as shown in the figure.
a) Find the area of R.
b) Find the area of S.
c) Region $S$ is the base of a solid. For this solid, each cross section perpendicular to the x -axis is a square. Find the volume of the solid.
d) Find the volume of the solid generated when $S$ is revolved about the horizontal line $\mathrm{y}=-1$.
e) Find the perimeter of the region S.
