

Name _____

Each problem is worth 25 points.

1.a) Calculate the area of the planar region in the first quadrant bounded by the curves $y = 0$, $x = 9$, and $y = \sqrt{x}$.

b) Calculate the volume of the solid generated when the region in part a. is rotated about the y axis.

c) Calculate the volume of the solid generated when the region in part a. is rotated about the x axis.

2.

a) Find the volume of the solid generated when the curve $y = \sqrt{x} e^{-x^2} = \sqrt{x} \exp(-x^2)$ from $x = 0$ to $x = a$ is rotated about the x axis.

b) What is the limit of the solid's volume as $a \rightarrow \infty$?

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3. Consider the curve $y = (a^2 - x^2)^{1/2}$ from $0 \leq x \leq a$.

a) What is the arc length of this curve from $0 \leq x \leq a$.

c) What is the lateral surface of the solid generated when this curve is rotated about the y axis?

4. A liquid of mass density ρ fills a right circular cone of base radius r and height h to a depth D ($D < h$). Calculate the work done in pumping all of this liquid out the top of the cone.

