Calculus Name_____ ID: 1

Volume - Known Cross Sections!

Date_____ Period____

For each problem, find the volume of the specified solid.

1) The base of a solid is the region enclosed by the semicircle $y = \sqrt{49 - x^2}$ and the x-axis. Cross-sections perpendicular to the x-axis are semicircles.

2) The base of a solid is the region enclosed by the semicircle $y = \sqrt{36 - x^2}$ and the x-axis. Cross-sections perpendicular to the y-axis are equilateral triangles.

3) The base of a solid is the region enclosed by the ellipse $\frac{x^2}{9} + \frac{y^2}{16} = 1$. Cross-sections perpendicular to the y-axis are semicircles.

4) The base of a solid is the region enclosed by the circle $x^2 + y^2 = 16$. Cross-sections perpendicular to the x-axis are semicircles.

5) The base of a solid is the region enclosed by the semicircle $y = \sqrt{16 - x^2}$ and the x-axis. Cross-sections perpendicular to the y-axis are squares.

6) The base of a solid is the region enclosed by the ellipse $\frac{x^2}{49} + \frac{y^2}{4} = 1$. Cross-sections perpendicular to the x-axis are equilateral triangles.

7) The base of a solid is the region enclosed by the semicircle $y = \sqrt{9 - x^2}$ and the x-axis. Cross-sections perpendicular to the y-axis are semicircles.

8) The base of a solid is the region enclosed by the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$. Cross-sections perpendicular to the y-axis are equilateral triangles.

9) The base of a solid is the region enclosed by the ellipse $\frac{x^2}{36} + \frac{y^2}{25} = 1$. Cross-sections perpendicular to the y-axis are rectangles with heights half that of the side in the xy-plane.

10) The base of a solid is the region enclosed by $y = 1$ and $y = x^2$. Cross-sections perpendicular to the y-axis are equilateral triangles.

Answers to Volume - Known Cross Sections! (ID: 1)

1) $\frac{\pi}{8}\int_{-7}^{7}\left(\sqrt{49-x^2}\right)^2\,dx$

$=\frac{343\pi}{6}\approx 179.594$

2) $\frac{\sqrt{3}}{4}\int_{0}^{6}\left(\sqrt{36-y^2}+\sqrt{36-y^2}\right)^2\,dy$

$=144\sqrt{3}\approx 249.415$

3) $\frac{\pi}{8}\int_{-4}^{4}\left(\sqrt{9-\frac{9y^2}{16}}+\sqrt{9-\frac{9y^2}{16}}\right)^2\,dy$

$=24\pi\approx 75.398$

4) $\frac{\pi}{8}\int_{-4}^{4}\left(\sqrt{16-x^2}+\sqrt{16-x^2}\right)^2\,dx$

$=\frac{128\pi}{3}\approx 134.041$

5) $\int_{0}^{4}\left(\sqrt{16-y^2}+\sqrt{16-y^2}\right)^2\,dy$

$=\frac{512}{3}\approx 170.667$

6) $\frac{\sqrt{3}}{4}\int_{-7}^{7}\left(\sqrt{4-\frac{4x^2}{49}}+\sqrt{4-\frac{4x^2}{49}}\right)^2\,dx$

$=\frac{112\sqrt{3}}{3}\approx 64.663$

7) $\frac{\pi}{8}\int_{0}^{3}\left(\sqrt{9-y^2}+\sqrt{9-y^2}\right)^2\,dy$

$=9\pi\approx 28.274$

8) $\frac{\sqrt{3}}{4}\int_{-3}^{3}\left(\sqrt{25-\frac{25y^2}{9}}+\sqrt{25-\frac{25y^2}{9}}\right)^2\,dy$

$=100\sqrt{3}\approx 173.205$

9) $\frac{1}{2}\int_{-5}^{5}\left(\sqrt{36-\frac{36y^2}{25}}+\sqrt{36-\frac{36y^2}{25}}\right)^2\,dy$

$=480$

10) $\frac{\sqrt{3}}{4}\int_{0}^{1}\left(\sqrt{y}+\sqrt{y}\right)^2\,dy$

$=\frac{\sqrt{3}}{2}\approx 0.866$