Calculus Name_____ ID: 1

Volume Washer - about Axes!

Date_____ Period____

For each problem, find the volume of the solid that results when the region enclosed by the curves is revolved about the the *x*-axis.

1) $y = 2\sec x,\ y = \sec x,\ x = -\frac{\pi}{6},\ x = 0$

2) $y = -x^2 + 5,\ y = 1$

3) $y = 2\sqrt{\cos x},\ y = \sqrt{\cos x},\ x = -\frac{\pi}{4},\ x = 0$

4) $y = -x^2 + 4,\ y = x + 2,\ x = -2,\ x = 0$

5) $y = 4,\ y = \frac{1}{x},\ x = 3$

For each problem, find the volume of the solid that results when the region enclosed by the curves is revolved about the the *y*-axis.

6) $x = 2\csc y,\ x = \csc y,\ y = \frac{\pi}{2},\ y = \frac{3\pi}{4}$

7) $x = 2,\ x = \sqrt{\cos y},\ y = -\frac{\pi}{2},\ y = \frac{\pi}{2}$

8) $x = \sqrt{y} + 3,\ x = \frac{y}{2} + 3$

9) $x = -y^2 + 6,\ x = 2$

10) $x = -y^2 + 5,\ x = y + 3,\ y = -1,\ y = 0$

Answers to Volume Washer - about Axes! (ID: 1)

1) $\pi \int_{-\frac{\pi}{6}}^{0} \left((2\sec x)^2 - \sec^2 x \right) dx$

$= \sqrt{3} \cdot \pi \approx 5.441$

2) $\pi \int_{-2}^{2} \left(\left(-x^2 + 5 \right)^2 - 1 \right) dx$

$= \frac{832}{15}\pi \approx 174.254$

3) $\pi \int_{-\frac{\pi}{4}}^{0} \left(\left(2\sqrt{\cos x} \right)^2 - \left(\sqrt{\cos x} \right)^2 \right) dx$

$= \frac{3\sqrt{2}}{2}\pi \approx 6.664$

4) $\pi \int_{-2}^{0} \left(\left(-x^2 + 4 \right)^2 - (x + 2)^2 \right) dx$

$= \frac{72}{5}\pi \approx 45.239$

5) $\pi \int_{\frac{1}{4}}^{3} \left(4^2 - \left(\frac{1}{x} \right)^2 \right) dx$

$= \frac{121}{3}\pi \approx 126.711$

6) $\pi \int_{\frac{\pi}{2}}^{\frac{3\pi}{4}} \left((2\csc y)^2 - \csc^2 y \right) dy$

$= 3\pi \approx 9.425$

7) $\pi \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \left(2^2 - \left(\sqrt{\cos y} \right)^2 \right) dy$

$= (4\pi - 2)\pi \approx 33.195$

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

$= \frac{32}{3}\pi \approx 33.51$

9) $\pi \int_{-2}^{2} \left(\left(-y^2 + 6 \right)^2 - 2^2 \right) dy$

$= \frac{384}{5}\pi \approx 241.274$

10) $\pi \int_{-1}^{0} \left(\left(-y^2 + 5 \right)^2 - (y + 3)^2 \right) dy$

$= \frac{233}{15}\pi \approx 48.799$