February 28

Why do we use π when finding the volume by revolution?

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Students will verbally explain how to find the volume using the disk method.

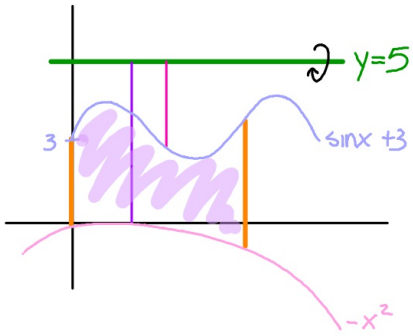
(using the words:
limit, expand, simplify…)

Disk Method

$$V = \pi \int_a^b (OR)^2 - (IR)^2 \, dx$$

Slices are perpendiskular to the axis of rotation

Find the volume of the solid generated by revolving the region bounded by
$y = \sin(x) + 3$
$y = -x^2$
on $[0, \pi]$
about $y = 5$



$OR = 5 - (-x^2)$

$OR = 5 + x^2$

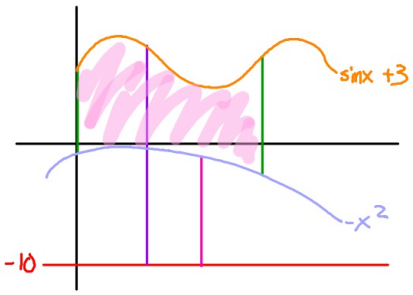
$IR = 5 - (\sin x + 3)$

$IR = 5 - \sin x - 3$

$$V = \pi \int_0^{\pi} (5 + x^2)^2 - (5 - \sin x - 3)^2 \, dx$$

$= 744.434$

Find the volume of the solid generated by revolving the region bounded by
$y = \sin(x) + 3$
$y = -x^2$
on $[0, \pi]$
about $y = -10$



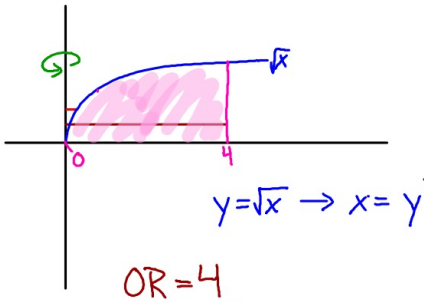
$OR = \sin x + 3 - (-10)$

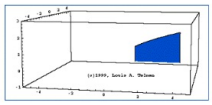
$IR = -x^2 - (-10)$

$$V = \pi \int_0^{\pi} (\sin x + 3 + 10)^2 - (-x^2 + 10)^2 \, dx$$

$$= 1306.416$$

Find the volume of the solid generated by revolving the region bounded by
$y = \sqrt{x}$, $x = 0$ and $x = 4$
about the y-axis





$y = \sqrt{x} \rightarrow x = y^2$

$OR = 4$

$IR = y^2$ ($\sqrt{4} = 2$)

$$V = \pi \int_0^2 4^2 - (y^2)^2 \, dy = 80.424$$