

February 27

How is finding the volume  
different from finding the area?

$$\int_a^b f(x) dx$$

$$\pi \int_a^b (f(x))^2 dx$$



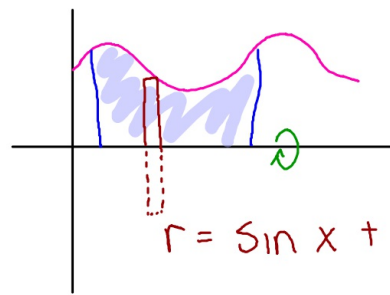
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Students will verbally explain how to  
find the volume using the disk  
method.

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



Find the volume of the solid generated by revolving the region bounded by  $y = \sin(x) + 4$ ,  $x = 1$  and  $x = 4$  about the x-axis



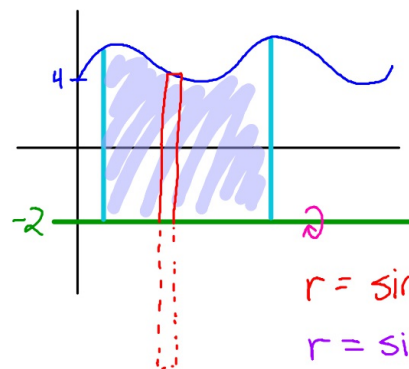
$$r = \sin x + 4$$

$$V_{\text{slice}} = \pi (\sin x + 4)^2 dx$$

$$V_{\text{total}} = \pi \int_1^4 (\sin x + 4)^2 dx$$

$$= 185.453$$

Find the volume of the solid generated by revolving the region bounded by  $y = \sin(x) + 4$ ,  $y = -2$ ,  $x = 1$  and  $x = 4$  about the line  $y = -2$



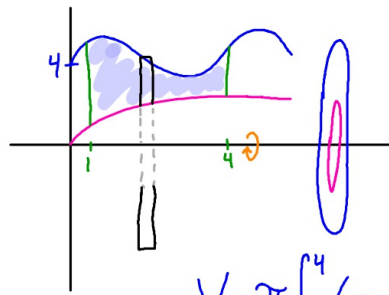
$$r = \sin x + 4 - (-2)$$

$$r = \sin x + 6$$

$$V = \pi \int_1^4 (\sin x + 6)^2 dx$$

$$= 388.952$$

Find the volume of the solid generated by revolving the region bounded by  $y = \sin(x) + 4$ ,  $y = \sqrt{x}$ ,  $x = 1$  and  $x = 4$  about the x-axis

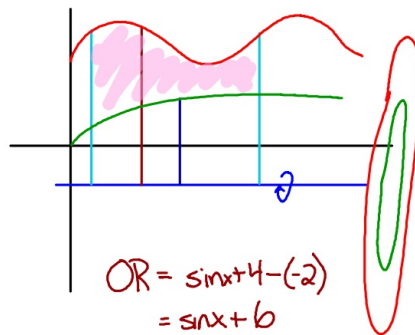


$$V = \pi \int_1^4 (\sin x + 4)^2 dx - \pi \int_1^4 (\sqrt{x})^2 dx$$

$$V = \pi \int_1^4 (\sin x + 4)^2 - (\sqrt{x})^2 dx$$

$$= 161.891$$

Find the volume of the solid generated by revolving the region bounded by  $y = \sin(x) + 4$ ,  $y = \sqrt{x}$ ,  $x = 1$  and  $x = 4$  about the line  $y = -2$



$$OR = \sin x + 4 - (-2)$$

$$= \sin x + 6$$

$$IR = \sqrt{x} - (-2)$$

$$= \sqrt{x} + 2$$

$$V = \pi \int_1^4 (\sin x + 6)^2 - (\sqrt{x} + 2)^2 dx = 269.048$$

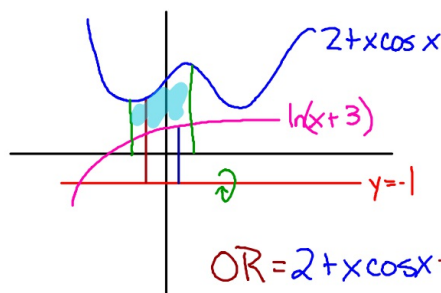
# Volume of Revolution

$$\pi \int_a^b OR^2 - IR^2 dx$$

outside radius =  $OR$  = upper  $y$  - lower  $y$   
from the far function  
to axis of rotation

inside radius =  $IR$  = upper  $y$  - lower  $y$   
from the close function  
to axis of rotation

Find the volume  
of the solid generated  
by revolving the  
region bounded by  
 $y = 2 + x(\cos(x))$   
 $y = \ln(x + 3)$   
 $x = -2$  and  $x = 1$   
about the  ~~$x$~~ -axis  
line  $y = -1$



$$OR = 2 + x \cos x - (-1)$$

$$IR = \ln(x + 3) - (-1)$$

$$V = \pi \int_{-2}^1 (2 + x \cos x + 1)^2 - (\ln(x + 3) + 1)^2 dx$$

$$= 52.493$$