8.3 Rotation Day 2

Thursday, March 16, 2017 8:38 AM

AP Calculus AB
Solids of Revolution – Day 2

Let R be the region enclosed between the graphs of $y = 2$ and $y = 18 - x^2$. Write an integral expression for the volume of the solid that is formed when region R is revolved about each of the given lines. You do not need to simplify your expressions.

$2 = 18 - x^2$

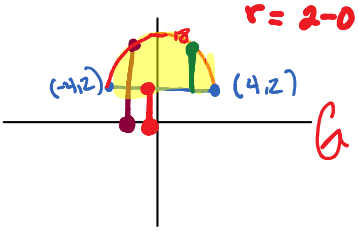
$A_B - A_S$

$A_{cs} = \pi(18-x^2)^2 - \pi(2)^2$

a) The x axis.

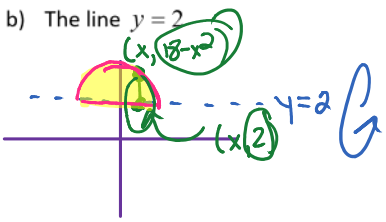
$R = 18 - x^2 - 0 = 18 - x^2$

$r = 2 - 0 = 2$



$V = \pi \int_{x=-4}^{x=4} [(18-x^2)^2 - 4]\,dx \approx 4503.787$

b) The line $y = 2$

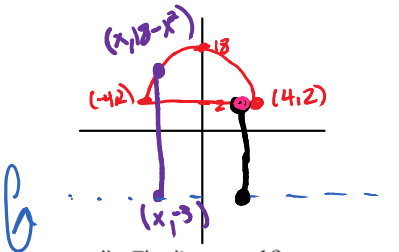


$A_{cs} = \pi r^2$

$r = 18 - x^2 - 2 = 16 - x^2$

$V = \pi \int_{x=-4}^{x=4} (16-x^2)^2\,dx \approx 3431.457$

c) The line $y = -3$



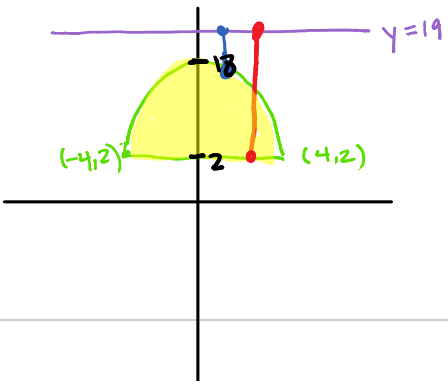
$R = (18-x^2) - (-3) = 21 - x^2$

$r = 2 - (-3) = 5$

$A_{cs} = \pi(21-x^2)^2 - \pi(5^2)$

$V = \pi \int_{x=-4}^{x=4} ((21-x^2)^2 - 25)\,dx \approx 6112.283$

d) The line $y = 19$

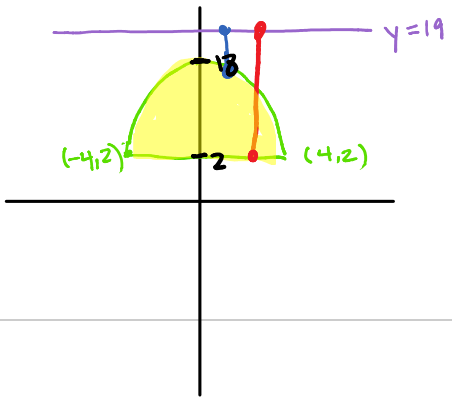


$R = 19 - 2 = 17$

$r = 19 - (18 - x^2) = 1 + x^2$

$A_{cs} = 17^2\pi - (1+x^2)^2\pi$

$V = \pi \int_{-4}^{4} (17^2 - (1+x^2)^2)\,dx$



$R = 19-2 = 17$

$r = 19-(18-x^2)$

$= 1+x^2$

$A_{cs} = 17\pi - (1+x^2)\pi$

$$V = \pi\int_{-4}^{4}\left(17^2-(1+x^2)^2\right)dx$$