

# Volumes Using Disks

Numberbender | WORKSHEET



Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_

Find the volume of each region revolved about the given axis. Show all work.

## Calculus Worksheet #49 Volumes Using Disks

Notes: Today you learn how to find volumes using DISKS:  $\text{Volume} = \pi \int_a^b r^2$

**Easy** (Disk Method)

1. Find the volume of  $y = x^2$ ,  $y = 4$  revolved around the y-axis.

Cross sections are **circular disks**.

"Thickness" of disks is  $y_2 - y_1$  or  $dy$ .

$[y = x^2, \text{ so } x = \sqrt{y}] \quad r = x = \sqrt{y}$ $\int_{y=0}^{y=4} \pi r^2 dy \Rightarrow \pi \int_0^4 r^2 dy \Rightarrow$ $\pi \int_0^4 (\sqrt{y})^2 dy \Rightarrow \pi \int_0^4 y dy \Rightarrow$ $\pi \cdot \frac{y^2}{2} \Big _0^4 = \pi \left[ \frac{16}{2} \right] = \boxed{8\pi}$		
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Find the volume of the region formed by revolving the following regions about the given axis.

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|--|--|
| 1. $y = x^2, x = -1, x = 4, y = 0$ ( $x$ -axis), | 2. $y = x^2, y = 2$ , ( $y$ -axis)           |
| 3. $y = x, y = 2, x = 0$ ( $y$ -axis)            | 4. $y = x^4, x = 1, y = 0$ ( $x$ -axis)      |
| 5. $y = \sqrt{9 - x^2}, y = 0$ ( $x$ -axis)      | 6. $y = \sqrt{x}, y = 2, x = 0$ ( $y$ -axis) |

7.  $\int_0^1 \frac{e^x}{(3 - e^x)^2} dx$  equals \_\_\_\_\_

8.  $\int 5^x dx$  \_\_\_\_\_

9. Find the **equation(s)** of the asymptote(s) for the graph of  $y = \frac{2x^2 - x - 1}{x^2 - x}$

10. Find the limit:  $\lim_{x \rightarrow -1} \frac{x^2 - 5x - 6}{x + 1}$  \_\_\_\_\_

11. Find the limit:  $\lim_{x \rightarrow -2} \frac{x + 2}{x^3 + 8}$  \_\_\_\_\_

12.  $\int \frac{1}{2^x} dx$  \_\_\_\_\_

13. Evaluate:  $\log_a a^3$ . \_\_\_\_\_

14. Evaluate:  $\log_a \frac{1}{a}$ . \_\_\_\_\_

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15. Evaluate without a calculator:  $\log_3 \frac{1}{27}$  \_\_\_\_\_

16. Evaluate:  $\ln e^{1-x}$ . \_\_\_\_\_

For Problems 17-19 use:

$\int_{-1}^0 f(x) dx = -2$	$\int_0^1 f(x) dx = 1$	$\int_{-1}^0 g(x) dx = 3$
$\int_{-1}^1 g(x) dx = 7$	$\int_{-1}^1 h(x) dx = 5$	$\int_0^1 h(x) dx = 11$

17.  $\int_1^4 g(x) dx$  \_\_\_\_\_

18.  $\int_0^2 2g(x) - f(x) dx$  \_\_\_\_\_

19.  $\int_{-1}^1 h(x) dx$  \_\_\_\_\_

# Volumes Using Disks

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Answer key — for instructor use only.

## Answers:

1. $205\pi$	2. $2\pi$	3. $\frac{8\pi}{3}$	4. $\frac{\pi}{9}$	5. $36\pi$	6. $\frac{32\pi}{5}$
7. $\frac{e-1}{2(3-e)}$	8. $\frac{5^x}{\ln 5} + C$	9. $y = 2$ $x = 0$	10. $-7$	11. $\frac{1}{12}$	12. $\frac{-1}{2^x \ln(2)}$
13. 3	14. -1	15. -3	16. $1-x$	17. 4	18. 8
19. 6					