

## Honors Calculus

### Volume by cross-section

#### Set up only.

1. Base bounded by $y = x^2 - 1$ , $y = x + 1$ Rectangles of height 5 perpendicular to the x axis	2. Base bounded by $y = x^3$ , $y = 0$ and $x = 2$ Semi-circles perpendicular to the y-axis
3. Base bounded in 1 <sup>st</sup> quadrant by $y = \sin x$ and $x = \pi$ Squares perpendicular to the x-axis	4. Base bounded by $y = \sqrt{x - 3}$ , x-axis, and $x = 7$ equilateral triangles perpendicular to the y-axis

#### Solve.

5. Base bounded by $y = x$ , $y = 0$ , and $x = 3$ Squares perpendicular to the y-axis	6. Base bounded in 1 <sup>st</sup> quadrant by $y = e^x$ , $y = 0$ and $x = 2$ . Semi-circles perpendicular to the x-axis
7. Base bounded in 1 <sup>st</sup> quadrant by $y = \frac{1}{x - 1}$ , $x = 2$ , and $x = 4$ . Rectangles of height 3 perpendicular to the x-axis	8. Base bounded by $y = \sqrt{x}$ , $x = 0$ , and $y = 2$ Equilateral triangles perpendicular to the y-axis

## Answers

1.  $5 \int_{-1}^2 (-x^2 + x + 2) dx$

2.  $\frac{\pi}{8} \int_0^8 (2 - \sqrt[3]{y})^2 dy$

3.  $\int_0^{\pi} \sin^2 x dx$

4.  $\frac{\sqrt{3}}{4} \int_0^2 (4 - y^2)^2 dy$

5. 9

6.  $\frac{\pi}{16} (e^4 - 1)$

7.  $3 \ln 3 = \ln 27$

8.  $\frac{8\sqrt{3}}{5}$