

MA 16020 LESSON 13: VOLUME BY REVOLUTION – SHELL METHOD (SUPPEMENTAL HOMEWORK)

Formulas:

- Rotating around y-axis:

$$V = 2\pi \int_a^b x \cdot (\text{Top} - \text{Bottom}) dx$$

- Rotating around $x = \#$

- If $a \geq \#$, then

$$V = 2\pi \int_a^b (x - \#) \times (\text{Top} - \text{Bottom}) dx$$

- If $b \leq \#$, then

$$V = 2\pi \int_a^b (\# - x) \times (\text{Top} - \text{Bottom}) dx$$

- Rotating around x-axis:

$$V = 2\pi \int_c^d y \cdot (\text{Right} - \text{Left}) dy$$

- Rotating around $y = \#$

- If $a \geq \#$, then

$$V = 2\pi \int_a^b (y - \#) \times (\text{Right} - \text{Left}) dy$$

- If $b \leq \#$, then

$$V = 2\pi \int_a^b (\# - y) \times (\text{Right} - \text{Left}) dy$$

(OPTIONAL HOMEWORK): Set up the integral using the **Shell Method** that represents the volume of the following solids about the given line:

1. $x = y$, $x = 0$, $y = 2$ about the x-axis

2. $x = 2y - y^2, \quad x = 0$

about the x-axis

3. $y = \sqrt{x}, \quad y = -x$

about the y-axis

4. $y = 2 - x^2, \quad y = x^2$

about the y-axis

5. $y = x$, $y = x^2$ about $x = -2$

6. $y = \sqrt{x}$, $y = 0$, $x = 1$ about $x = -1$

7. $y = x$, $y = x^2$ about $x = 3$

8. $y = 4x - x^2$, $y = 3$

about $x = 1$

9. $x = 2y - y^2$, $x = 1$,

$y = 0$

about $y = -1$

10. $x = y^2 + 1$, $x = 2$

about $y = -2$

11. $x = 4y^2 - y^3$, $x = 0$

about $y = 6$

12. $x = (y - 3)^2$, $x = 4$

about $y = 1$