17. (a) $\pi \int_0^{\pi/2} \cos^2 x \, dx$ describes the volume of the solid obtained by rotating the region $\mathcal{R} = \{(x,y) \mid 0 \le x \le \frac{\pi}{2}, 0 \le y \le \cos x\}$ of the xy-plane about the x-axis.

(b) $\pi \int_0^1 (y^4 - y^8)\, dy = \pi \int_0^1 \left[(y^2)^2 - (y^4)^2\right] dy$ describes the volume of the solid obtained by rotating the region $\mathcal{R} = \{(x,y) \mid 0 \le y \le 1, y^4 \le x \le y^2\}$ of the xy-plane about the y-axis.

18. (a) $\pi \int_2^5 y \, dy = \pi \int_2^5 (\sqrt{y})^2 \, dy$ describes the volume of the solid obtained by rotating the region $\mathcal{R} = \{(x,y) \mid 2 \le y \le 5, 0 \le x \le \sqrt{y}\}$ of the xy-plane about the y-axis.

(b) $\pi \int_0^{\pi/2} \left[(1+\cos x)^2 - 1^2\right] dx$ describes the volume of the solid obtained by rotating the region $\mathcal{R} = \{(x,y) \mid 0 \le x \le \frac{\pi}{2}, 1 \le y \le 1 + \cos x\}$ of the xy-plane about the x-axis.

Or: The solid could be obtained by rotating the region $\mathcal{R}' = \{(x,y) \mid 0 \le x \le \frac{\pi}{2}, 0 \le y \le \cos x\}$ about the line $y = -1$.

19. There are 10 subintervals over the 15-cm length, so we'll use $n = 10/2 = 5$ for the Midpoint Rule.

$$V = \int_0^{15} A(x)\, dx \approx M_5 = \frac{15-0}{5}[A(1.5) + A(4.5) + A(7.5) + A(10.5) + A(13.5)]$$

$$= 3(18 + 79 + 106 + 128 + 39) = 3 \cdot 370 = 1110 \text{ cm}^3$$