Chapter 8 Review Answers

1. a.Compute the volume of a solid whose base is the region bounded by $y = 4 - x^2$ and the x-axis and whose cross-sections perpendicular to the x-axis are equilateral triangles.

Ans:

$$\frac{\sqrt{3}}{2}\int_{-2}^{2}\left(4-x^2\right)^2 dx = \frac{256}{15}\sqrt{3} \approx 29.56$$

b.Now compute the volume of the solid with the same base but whose cross-sections perpendicular to the y-axis are equilateral triangles.

Ans:

$$2\sqrt{3}\int_{0}^{4}(4-y)\,dy = 16\sqrt{3} \approx 27.713$$

2. Find the volume of a region whose base is a triangle with vertices $(0,0)$, $(2,0)$, and $(0,1)$ and whose cross-section perpendicular to the x-axis are semi-circles.

Ans:

$$\frac{\pi}{8}\int_{0}^{2}\left(\frac{2-x}{2}\right)^2 dx = \frac{\pi}{12} \approx 0.261\,80$$

3. Section 8.4: 3,5,7,13,17,18,22

Ans:

3. a) 1.5 J, 13.5 J
   b) For $x = 4$ to $x = 5$ the force is larger
5. 1.489×10^{10} J
7. $11,000$ ft-lb
13. $354,673$ ft-lb
17. Bottom: 1597.6 lbs, Front and back: 499.2 lbs, Sides: 374.4 lbs.
18. a. Pressure at the bottom is 1.76 N/m^2
    b. Total force $= 3.2 \times 10^{11}$ N
22. $2\pi\sigma\left(\sqrt{R^2+a^2}-R\right)$

4. Chapter 8 Review: 5,8,9,10,12,15,18,20

Ans:

5. $\int_0^{12}\pi h\ dh = 72\pi$
8. $2\int_{-a}^{a}\sqrt{1+\left(\frac{b^2x^2}{a^2(a^2-x^2)}\right)}dx$
9. c. Volume= $\frac{\pi}{2}$
10. a. Volume=$\frac{5\pi}{6} \approx 2.62$
    b. Volume=$\frac{4\pi}{5} \approx 2.51$
12. b. 18π
15. Volume=$6\pi^2$
18. 4400 ft-lb
20. $661,619.41$ ft-lb