§7.1 Area Between Curves

In each of the following, find the areas between the given curves.

1. $y = x^2 + 2$, $y = -x$, $x = 0$, $x = 1$

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

3. $y = 3x^3 - x^2 - 10x$, $y = -x^2 + 2x$

4. $x = 3 - y^2$, $x = y + 1$

§7.2 Volumes

5. Find the volume of the solid whose base is bounded by $y = 1 - \frac{x}{2}$, $y = -1 + \frac{x}{2}$, $x = 0$, and whose vertical cross-sections are equilateral triangles.

6. Find the volume of the solid generated by rotating the region bounded by $y = 2 - x^2$, $y = 1$ about the line $y = 1$.

7. Find the volume of the solid generated by rotating the region bounded by $y = \sqrt{25 - x^2}$, $y = 3$ about x-axis.

8. Find the volume of the solid generated by rotating the region bounded by $y = x^2 + 1$, $y = 0$, $x = 0$, $x = 1$ about y-axis.

§7.3 Volumes by Cylindrical Shells

Using the method of cylindrical shells, find the volume of the solid generated by rotating the specified region about the specified line.

9. Region bounded by $y = x - x^3$, the x-axis ($0 \leq x \leq 1$) about the y-axis.

10. Region bounded by $x = e^{-y^2}$, the y-axis ($0 \leq y \leq 1$) about the x-axis.

11. Region bounded by $y = x^3 + x + 1$, $y = 1$, $x = 1$ about the line $x = 2$.

§7.4 Arc Length

Find the arc length for each of the following functions over the specified interval.

12. $y = \dfrac{x^3}{6} + \dfrac{1}{2x}$, $\left[\frac{1}{2}, 2\right]$

13. $(y-1)^3 = x^2$, $[0, 8]$

14. $y = \ln(\cos x)$, $[0, \frac{\pi}{4}]$

§7.6 Applications to Physics and Engineering

15. A force of 750 pounds compresses a spring 3 inches from its natural length of 15 inches. Find the work done in compressing the spring an additional 3 inches.

16. A tank in the shape of a right circular cone is half full of water. The tank is 6 ft across the top and 8 ft high. How much work is done in pumping all of the water out over the top edge of the tank?

MAT266 Exam 02 - Review (Solutions)

1. $\dfrac{17}{6}$

2. $\dfrac{9}{2}$

3. 24

4. $\dfrac{9}{2}$

5. $\dfrac{2\sqrt{3}}{3}$

6. $\dfrac{16\pi}{15}$

7. $\dfrac{256\pi}{3}$

8. $\dfrac{3\pi}{2}$

9. $\dfrac{4\pi}{15}$

10. $\pi\left(1-\frac{1}{e}\right) \approx 1.986$

11. $\dfrac{29\pi}{15}$

12. $\dfrac{33}{16}$

13. $\dfrac{1}{27}\left(40^{3/2}-4^{3/2}\right) \approx 9.073$

14. $\ln(\sqrt{2}+1) \approx 0.881$

15. 3375 inch-pounds

16. $\dfrac{1875}{2}\pi \approx 2945.2$ ft-lb