

MATH 138 Calculus 2, Exercises for Chapter 4

- 1:** Let $f(x) = 2 \sin\left(\frac{1}{2}x - \frac{\pi}{6}\right) + 1$ for $0 \leq x \leq 4\pi$.
- (a) Sketch the graph of $y = f(x)$ and shade the region which lies between the graph and the x -axis with $0 \leq x \leq 4\pi$ (one part of the region lies above the x -axis and one part lies below).
- (b) Find the exact area of the region described in part (a).
- 2:** Find the area of the region bounded by the curves $y^2 = 2x$ and $y = \frac{x}{x-3}$.
- 3:** Find the area of the region bounded by the curves $y = \sin x$ and $y = 1 - \frac{1}{\sqrt{3}} \sin(2x)$ between their two points of intersection with $0 \leq x \leq 2\pi$.
- 4:** A rod of length 3 m lies along the axis with one end at $x = 0$ and the other end at $x = 3$. The linear density at each point, in kg/m , is given by $\rho(x) = \sqrt{1 + 4x - x^2}$. Find the total mass and the average linear density of the rod.
- 5:** (a) Let R be the region given by $0 \leq y \leq 1 - \frac{1}{4}x^2$ and $-2 \leq x \leq 2$. Find the volume of the solid obtained by revolving R about the x -axis.
- (b) Let S be the region given by $\frac{1}{4}x^2 - 1 \leq y \leq 1 - \frac{1}{4}x^2$ and $0 \leq x \leq 2$. Find the volume of the solid obtained by revolving S about the y -axis.
- 6:** Let R be the (infinitely long) region given by $0 \leq y \leq \frac{1}{1+x^2}$ and $x \geq 0$.
- (a) Find the volume of the solid obtained by revolving R about the x -axis.
- (b) Find the volume of the solid obtained by revolving R about the y -axis.
- 7:** Find the volume of the solid which is obtained by revolving the disc $(x-1)^2 + y^2 \leq 1$ about the y -axis.
- 8:** A circular hole of radius 1 is bored through the center of a wooden ball of radius 2 . Find the volume of the remaining portion of the ball.
- 9:** Find the arclength of the curve $y = e^x$ with $0 \leq x \leq \ln 2$.
- 10:** Find the arclength of the portion of the parabola $y = x^2$ with $0 \leq x \leq 1$.
- 11:** Find the area of the surface which is obtained by revolving the portion of the cubic curve $y = x^3$ with $0 \leq x \leq 1$ about the y -axis.