1. Find the area of the shaded region. (Answer: Area= $\frac{22}{3}$)

2. Find the area of the region bounded by the graphs of $y = \frac{1}{x}$ and $2x + 2y = 5$
   (Answer: Area= $\frac{15}{8} - 2\ln 2$)

3. Find the area of the region bounded by the graphs of $x = y^2 + 4y$ and $x = 0$
   (Answer: Area= $\frac{32}{3}$)
4. Refer to the plane region R bounded by the curves $y = x^2$, $y = 1$ and $x = 0$.
For each case, find the volume of the solid $S$ generated by revolving the region R about the given axis.

(a). The line $y = 0$ is the axis of rotation (Answer: $V = \frac{4\pi}{5}$)

(b). The line $x = 0$ is the axis of rotation. (Answer: $V = \frac{\pi}{2}$)
(c). The line $y = 2$ is the axis of rotation. (Answer: $V = \frac{28\pi}{15}$)

(d). The line $x = 2$ is the axis of rotation. (Answer: $V = \frac{13\pi}{6}$)
5. Refer to the plane region \( R \) bounded by the curves \( y = \sqrt{x - 2} \), \( y = 0 \) and \( x = 6 \). Find the volume of the solid \( S \) generated by revolving the region \( R \) about the \( x \)-axis. (Answer: \( V = 8\pi \))

6. Refer to the plane region \( R \) bounded by the curves \( y = 2x^2 + 4x \) and \( y = 0 \). Find the volume of the solid \( S \) generated by revolving the region \( R \) about the \( y \)-axis. (Answer: \( V = \frac{16\pi}{3} \))

7. A force of 650 pounds compresses a spring 5 inches from its natural length. Find the work done in compressing the spring 2 additional inches. (Answer: \( W = 1560 \text{ inch} \cdot \text{pounds} \))
8. Suppose that 2 J of work is needed to stretch a spring from its natural length of 30 cm to a length of 42 cm. How much work is needed to stretch it from 35 cm to 40 cm?
   (Answer: $k \approx 277.78 \text{N/m}$ $W \approx 1.04 \text{J}$)

9. 2. A colony of bacteria is of size $S(t) = 300e^{0.1t}$ after $t$ hours. Find the average size during the first 12 hours (that is, from $t = 0$ to $t = 12$).
   (Answer: $S_{\text{ave}} = 580$)

10. In a certain city the temperature (in °F) $t$ hours after 9 A.M. was modeled by the function $T(t) = 50 + 14\sin\frac{\pi t}{12}$. Find the average temperature during the period from 9 A.M to 9 P.M
    (Answer: $T_{\text{ave}} \approx 59° \text{F}$)

11. Find all numbers $b$ such that the average value of $f(x) = 2 + 6x - 3x^2$ on the interval $[0, b]$ is equal to 3.
    (Answer: $b = \frac{3 \pm \sqrt{5}}{2}$)