1. Let R be the region bounded by the curve $y = (x-2)^2$ and the line $y = 4$.
    a. Find the volume of the solid generated by revolving R about the x-axis.
    b. Find the volume of the solid generated by revolving R about the y-axis.
    c. Find the volume of the solid generated by revolving R about the line $x = -1$.

2. Find the arc length of the curve $y = \frac{1}{3}(x^2 + 2)^{3/2}$ for $0 \le x \le 1$.

3. A conical tank 5 ft in diameter and 10 feet in height is resting on its base. The tank is filled with oil (density 40 lb/ft³), how much work is required to pump all the oil over the top of the tank?

4. Evaluate the following:

    a. $\int x \arctan x \, dx$.

    b. $\int \frac{x^2 + 8x - 3}{x^3 + 3x^2} dx$

    c. $\int \frac{x^3}{\sqrt{x^2 + 9}} dx$

    d. $\int \frac{x^2}{\left(4 - x^2\right)^{3/2}} dx$

    e. $\int_1^3 \frac{1}{\sqrt[3]{x - 2}} dx$

5. Using calculus, find the surface area of a sphere of radius r.

6. Write the Taylor series for $f(x) = \frac{1}{2x - 5}$ at $a = 3$.

7. Find the radius and interval of convergence for the power series $\displaystyle\sum_{n=1}^{\infty} \frac{(x+2)^n}{n4^n}$.

8. Determine whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt[4]{n}}$ converges absolutely, converges conditionally or diverges.

9. Determine whether the series $\sum\limits_{n=1}^{\infty} \dfrac{n^2-1}{3n^4+1}$ converges or diverges.

10. Find the six roots of $-64i$.

11. Find the area of the region inside $r=-3\cos\theta$ and outside $r=1-\cos\theta$.

12. Replace the polar equation $r=3\cos\theta$ with the Cartesian equation. Identify or describe the graph.

13. For the parametric curve $x=e^{\sqrt{t}}$, $y=t-\ln t^2$, write the equation of the line tangent to the curve at $t=1$.

14. For curve, C, defined by the parametric equations

$$x=4\sqrt{t}, \quad y=\dfrac{t^3}{3}+\dfrac{1}{2t^2} \quad 1\le t \le 4,$$

    a. Find the arc length of the curve C.
    b. Find the surface area when the curve C is rotated about the x-axis.

15. Evaluate the expression
    a. $\dfrac{3+2i}{1+i}$
    b. $\left(\dfrac{1}{2}+\dfrac{1}{2}i\right)^{15}$
    c. $\left|-1+2\sqrt{2}i\right|$