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 \( 0 \leq x \leq 1 \).

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/ft\(^3\)), 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. \( \int \frac{x^2}{(4 - x^2)^{3/2}} \, dx \)
   e. \( \int \frac{1}{\sqrt{x - 2}} \, dx \)

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 \( \sum_{n=1}^{\infty} \frac{(x + 2)^n}{n4^n} \).

8. Determine whether the series \( \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt[4]{n}} \) converges absolutely, converges conditionally or diverges.
9. Determine whether the series \( \sum_{n=1}^{\infty} \frac{n^2 - 1}{3n^4 + 1} \) 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 \( x = e^{t^2}, \ y = t - \ln t^2 \), write the equation of the line tangent to the curve at \( t = 1 \).

14. For curve, \( C \), defined by the parametric equations

\[
x = 4\sqrt{t}, \quad y = \frac{t^3}{3} + \frac{1}{2t^2} \quad 1 \leq t \leq 4,
\]

   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. \( \frac{3 + 2i}{1 + i} \)
   b. \( \left( \frac{1}{2} + \frac{1}{2}i \right)^{15} \)
   c. \( |-1 + 2\sqrt{2}i| \)