1. Consider the region bounded by \( y = x^2, \ y = \sqrt{8x} \). Set up (but do not solve) integrals to find
   (a) The area of this region.
   (b) The volume of the solid generated by rotating this region about the y-axis using both shells and washers.
   (c) The volume of the solid generated by rotating this region about the horizontal line \( y = 5 \) using any method.
   (d) The moment about the x-axis and the moment about the y-axis of this region.

2. Set up (but do not solve) an integral to find the arc length of \( y = \sqrt{8x} \), for \( 0 \leq x \leq 2 \).

3. Graph the cardioid \( r = 3(1 - \cos(\theta)) \) and set up an integral to find the area it encloses.

4. Evaluate the following integrals.
   (a) \( \int x^2 \sin(3x) \, dx \)  
   (b) \( \int \frac{2x}{(x - 3)^2} \, dx \)
   (c) \( \int \frac{\csc(\ln(3x))}{2x} \, dx \)  
   (d) \( \int \frac{x^2}{\sqrt{9 - x^2}} \, dx \)

5. Indicate if the following series converge or diverge. You must identify all the tests you use and show all the work needed to apply them.
   (a) \( \sum_{k=2}^{\infty} \frac{\sqrt{k} - 3}{k^2} \)
   (b) \( \sum_{k=1}^{\infty} \frac{(2k)!}{e^k} \)
   (c) \( \sum_{k=2}^{\infty} \frac{\sin(3k)}{k!} \)
   (d) \( \sum_{k=2}^{\infty} \frac{2}{k} - \frac{2}{k + 1} \)

6. Find the interval and radius of convergence of the power series \( \sum_{k=3}^{\infty} \frac{2}{3^k} (x - 4)^k \).

7. Find the first 3 terms of the Maclaurin series for \( f(x) = \sqrt{x + 3} \).

8. If \( u = <1, 0, -2> \) and \( v = <2, -3, 0> \), find
   (a) \( u - 3v \)
   (b) The cosine of the angle between \( u \) and \( v \)
   (c) The area of the parallelogram spanned by \( u \) and \( v \).