Part I. Determine whether the statement is true or false:

1. If \( \lim_{n \to \infty} a_n = 0 \), then \( \sum_n a_n \) is convergent.
2. If \( \sum c_n 6^n \) is convergent, then \( \sum c_n (-2)^n \) is convergent.
3. If \( \sum c_n 6^n \) is convergent, then \( \sum c_n (-6)^n \) is convergent.
4. If \( \sum c_n x^n \) diverges at \( x = 6 \), then it diverges when \( x = 10 \).
5. If \( 0 \leq a_n \leq b_n \), and \( \sum b_n \) diverges, then \( \sum a_n \) diverges.
6. If \( \sum a_n \) is divergent, then \( \sum |a_n| \) is divergent.
7. If \( f(x) = 2x - x^2 + \frac{1}{2}x^3 - \cdots \) converges for all \( x \), then \( f''(0) = 2 \).
8. If \( \sum a_n \) converges, then \( \lim_{n \to \infty} a_n = 0 \).
9. If \( a_n > 0 \) and \( \sum a_n \) converges, then \( \sum (-1)^n a_n \) converges.
10. If \( p > 1 \), then \( \sum_{k=1}^{\infty} \frac{8}{k^p} \) converges.

Part II. Show your work:

1. All homework assignments.
2. Determine if the integrals are convergent. Evaluate those that are convergent.
   \[ \int_2^\infty \frac{1}{(x - 3)^{4/3}} \, dx, \quad \int_0^2 \frac{x - 3}{2x - 3} \, dx \]
3. Determine if the series is convergent. If it is convergent, find the sum.
   \[ \sum_{k=0}^{\infty} 4^{-k}, \quad \sum_{k=0}^{\infty} \frac{2k}{k + 3} \]
4. Determine if the series converges absolutely, conditionally or diverges.
   \[ \sum_{k=1}^{\infty} (-1)^k \frac{k}{k^2 + 1} \]
5. Find the radius and interval of convergence \( \sum_{k=0}^{\infty} \frac{4}{k!}(x - 2)^k \).
6. Find the Taylor polynomial of degree 4 of \( f(x) = \sin x + e^{3x} \) about the center \( a = 0 \).
7. Sketch the curve of the equation \( r = \cos 2\theta \) in polar coordinate.
8. Find the area of the region outside of \( r = 1 \) and inside of \( r = 4 \cos \theta \).