1. **Stokes’ Theorem** Verify that Stokes’ Theorem is true for the vector field \( \mathbf{F} = x^2 \mathbf{i} + y^2 \mathbf{j} + z^2 \mathbf{k} \) and the region \( S \) is bounded by the paraboloid \( z = 1 - x^2 - y^2 \) and the plane \( z = 0 \).

   (a) Write down Stokes’ Theorem.

   (b) Compute both sides of the equation for Stokes’ Theorem.
2. **Divergence Theorem** \( S \) is the solid bounded by \( 0 \leq y^2 + z^2 \leq 1 \) and \( 0 \leq x \leq 2 \). Use the Divergence Theorem to calculate the flux of \( \mathbf{F} = (x + z^2)\mathbf{i} + (y - z^2)\mathbf{j} + x\mathbf{k} \) through \( \partial S \).
Review:

3. (Taylor Series) Find the Taylor Series at \( a = 1 \) for the antiderivative of \( \frac{\arctan(x - 1)}{x - 1} \).
4. (Optimization) Find the extreme value of $f(x, y) = e^{-4xy}$ on the region described by $4x^2 + y^2 \leq 1$. 
5. **(Multiple Integral)** Compute \( \iiint_E x \, dV \), where \( E \) is bounded by the paraboloid \( x = 4y^2 + 4z^2 \) and the plane \( x = 4 \).