1. Consider the function 
\[ f : \mathbb{R}^2 \rightarrow \mathbb{R}^3 
\]
\[ f(x, y) = (x^2 - y^2, 2xy, e^{2x+y}) \]
Find \( Df \left( \frac{1}{2}, -1 \right) \).

2. Given \( f(x, y) = e^{2x+5y} \). Find the 2\(^{nd}\)-order Taylor polynomial for \( f \) at \((0, 0)\).

3. Evaluate the iterated integral 
\[ \int_{y=0}^{3} \int_{x=\frac{1}{3}y}^{1} \sin(x^2) \, dx \, dy \]
by changing the order of integration. Be sure to clearly sketch the region of integration and indicate how you found the new limits of integration.

4. Let \( D \) be the region bounded by the lines 
\[ x + y = 0, \quad x + y = 2, \quad x - y = 0, \quad x - y = 2. \]
Evaluate 
\[ \iint_D (x + y)e^{x^2-y^2} \, dx \, dy \]
using the change of variables \( u = x+y, \quad v = x-y \).