1. Find the equation of the tangent plane to \( f(x, y) = x^2 + y^2 \) at (3, 4).

2. Use the chain rule to find \( \frac{\partial z}{\partial s} \) and \( \frac{\partial z}{\partial t} \) if \( z = xe^y + ye^{-x}, \) \( x = e^t \) and \( y = st^2 \).

3. Set up but do NOT evaluate the iterated integral (or sum of iterated integrals) for the volume under the surface of \( z = xy \cos(x+y) + e^{x^2} \sqrt{2y+5} \) and above the region bounded by \( x = y^2 \) and \( x + y = 2. \)

4. Find the directional derivative of \( f(x, y, z) = \sqrt{xyz} \) at the point (2, 4, 2) in the direction of the vector \( \langle 4, 2, -4 \rangle. \)

5. The function \( f(x, y) = x^3 - 3xy + y^3 \) has a pair of critical points find them and determine if they are local minimums, local maxima or saddle points.

6. Show the limit \( \lim_{(x,y) \to (0,0)} \frac{2xy}{x^2 + 2y^2} \) does not exist.

7. Sketch the region of integration and change the order of integration of \( \int_1^2 \int_0^{\ln x} f(x, y) \ dy \ dx \)

8. Use Lagrange multipliers to find the maximum and minimum values of \( f(x, y) = x^2 - y^2 \) subject to the constraint \( x^2 + y^2 = 4. \)

9. Compute the mass of the lamina of the region in the first quadrant inside \( x^2 + y^2 = 9 \) and outside \( x^2 + y^2 = 1 \) with density \( \rho(x, y) = e^{-(x^2+y^2)}. \) Polar co-ordinates might come in handy.

10. Below are maple contour plots of the functions (in some order) of \( \sin(x) \sin(y), \sin(xy), \sin(x) + \sin(y) \) and \( \sin(x + y) \) Identify which is which. The plots are over \([0, 2\pi] \times [0, 2\pi].\)