Example. 1. Find the tangent plane to the elliptic paraboloid \( z = 3x^2 + y^2 \) at the point \((1, 2, 7)\).

Example. 2. Show that \( f(x, y) = xe^{xy} - x^2 \) is differentiable at \((0, 1)\) and find its linearization there.

Example. 3. (a) If \( z = f(x, y) = x^3 + 2xy - y^2 \), find the differential \( dz \).
(b) If \( x \) changes from 2 to 2.03 and \( y \) changes from 3 to 2.95, compare the values of \( \Delta z \) and \( dz \).

Example. 4. The length and width of a rectangle are measured as 52 cm and 50 cm, respectively, with an error in measurement of at most 0.02 cm in each. Use differentials to estimate the maximum error in the calculated area of the rectangle.

Example. 5. Use differentials to estimate the amount of metal in a closed cylindrical can that is 26 cm high and 8 cm in diameter if the metal in the top and the bottom is 0.3 cm thick and the metal in the sides is 0.06 cm thick.

Example. 6. The pressure, volume, and temperature of a mole of an ideal gas are related by the equation

\[ PV = 8.25T \]

where \( P \) is measured in kilopascals, \( V \) in liters, and \( T \) in kelvins. Use differentials to find the approximate change in the pressure if the volume increases from 11 L to 11.2 L and the temperature decreases from 310 K to 300 K.