1. Compute the gradient of the function \( f(x,y) = \sin(3x + 2y) \) and evaluate the gradient at the point \((\pi, 3\pi/2)\).

2. Find the directional derivative of the function \( f(x,y) = \sqrt{4 - x^2 - 2y} \) at the point \((2, -2)\) in the direction \( \left< \frac{1}{\sqrt{5}}, \frac{2}{\sqrt{5}} \right> \).

3. Let \( f(x,y) = x^4 - x^2y + y^2 + 6 \). At the point \((-1, 1)\) find the unit vectors that give the direction of steepest ascent and steepest decent. Then find a vector that points in the direction of no change in the function at \((-1, 1)\).

4. Consider the paraboloid \( f(x,y) = 9 - \frac{x^2}{4} - \frac{y^2}{25} \) and the point \((-6, 0)\) on the level curve \( f(x,y) = 0 \). Compute the slope of the line tangent to this level curve at \((-6, 0)\) and verify that the tangent line is orthogonal to the gradient.
5. Consider the surface

\[ f(x, y, z) = x^2 + 2y^2 - 3z^2 + 9 = 0, \]

which may be regarded as the level surface for the \( f(x, y, z) = 0 \). Find the gradient of \( f \) and evaluate it at \((-1, 1, 2)\). Find an equation of the plane orthogonal to the gradient which passes through \((-1, 1, 2)\).