Surfaces and Partial Differentiation – 2022 GCE Additional Pure Further Math A Y545

1. June/2022/Paper_ Y545/01/No.1

The surface E has equation $z = \sqrt{500 - 3x^2 - 2y^2}$.

(a) Determine the values of $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ at the point P on E with coordinates (11, –8, 3). **[4]**

(b) Find the equation of the tangent plane to E at P, giving your answer in the form $ax + by + cz = d$ where a, b, c and d are integers. **[2]**

2. June/2022/Paper_ Y545/01/No.9

For all real values of x and y the surface S has equation $z = 4x^2 + 4xy + y^2 + 6x + 3y + k$, where k is a constant and an integer.

(a) Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$. **[2]**

(b) Determine the smallest value of the integer k for which the whole of S lies above the x-y plane. **[7]**