Computer Practice 4

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Problem

Compute the tangent plane of z(x,y) at =(1,0) with:

$$z(x, y) = x^3 + y^3 + e^{xy}$$

Solution

This is the formula that we will use in order to compute the equation of the tangent plane:

$$f(x, y) = z(x_0, y_0) + \frac{\partial z}{\partial x}(x_0, y_0) * (x - x_0) + \frac{\partial z}{\partial y}(x_0, y_0) * (y - y_0) \qquad (1)$$

We compute each of the elements needed, for $(x_0, y_0) = (1, 0)$. First we compute $z(x_0, y_0)$.

$$z(x_0, y_0) = z(1, 0) = 1^3 + 0^3 + e^0 = 2$$

Now we compute both partial derivatives and evaluate them at $(x_0, y_0) = (1, 0)$.

$$\frac{\partial z}{\partial x}(x, y) = 3x^2 + y * e^{xy} \implies \frac{\partial z}{\partial x}(x_0, y_0) = 3 + 0 = 3$$

$$\frac{\partial z}{\partial y}(x, y) = 3y^2 + x * e^{xy} \implies \frac{\partial z}{\partial y}(x_0, y_0) = 0 + 1 = 1$$

Substituting in equation 1 we obtain the following:

$$f(x, y) = 2 + 3 * (x - 1) + 1 * (y - 0) \implies f(x, y) = 2 + 3 * x - 3 + 1 * y \implies$$

$\boxed{\text{f(x,y) = 3x + y - 1}}$