MATH116: QUIZ III

Name:
Student Number:
Section: 2
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Question
Is there a direction **u** in which the rate of change of $f(x, y) = x^2 - 3xy + 4y^2$ at $P(1, 2)$ equals 14? Give reasons for your answer.

Solution

$$(D_u f)_p = \mathbf{u} \cdot (\nabla f)_p = |(\nabla f)_p| \cos\theta = 14$$

Since

$$(\nabla f)_p = -4\mathbf{i} + 13\mathbf{j}$$

Then $|(\nabla f)_p| = \sqrt{185}$. Then

$$\cos\theta = \frac{14}{\sqrt{183}} > 1$$

Since there exists no real θ satisfying $\cos\theta > 1$ then there exists no direction **u** so that the rate of change of $f(x, y)$ at $P(3, 2)$ equals 14.