School of Mathematics and Physics, UQ

MATH2001/MATH7000 practice problems
Sheet 6

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(1) Find the critical points of $f(x, y) = -3x^2 - 2y^2 - 3z^2 + 2xy + 2yz$, if any, and classify them as relative maxima, relative minima, or saddle points.

(2) Find the critical points of $f(x, y) = x^3 - 3xy - y^3$, if any, and classify them as relative maxima, relative minima, or saddle points.

(3) Suppose that the Hessian matrix of a certain quadratic form $f(x, y)$ is;

$$\begin{pmatrix} 2 & 4 \\ 4 & 2 \end{pmatrix}.$$

What can you say about the location and classification of the critical points of f?

(4) Evaluate the following integrals

(a) $\displaystyle\int_0^2 \int_0^1 (x + y)\, dx\, dy$

(b) $\displaystyle\int_0^1 \int_0^2 (x^4 y^5 + y)\, dx\, dy$