

MATH275-002

Written Assignment #5

Due at class time, Monday, 4 October

- (1) Let $f(x, y) = xy(1 - x - y)$. Find the directional derivative of f at the point $(-2, 2)$ in the direction of $\mathbf{v} = \langle 1/\sqrt{10}, -3/\sqrt{10} \rangle$

- (2) Find the directions of the maximum and minimum rates of change for the function

$$f(x, y) = y^2 e^{4x}$$

at the point $(3, -1)$ and the values of those rates of change.

- (3) Find all critical points of

$$f(x, y) = 2x^2 + y^3 - x^2y - 3y$$

and classify them as local maxima, minima or saddle points, as appropriate.

- (4) Find the absolute extrema of

$$f(x, y) = x^2 + y^2 - 2x - 4y$$

on the region bounded by the graphs of $y = x$, $y = 3$ and $x = 0$.

- (5) Find all critical points of $f(x, y) = x^2y^2$ and show the second partials test fails for all of them. Then use the form of the function to determine what each critical point represents.