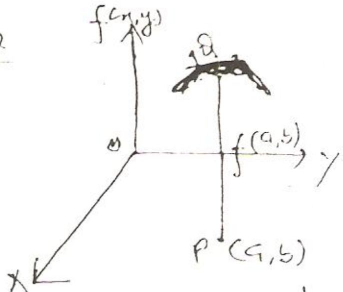
Maxima & Minima

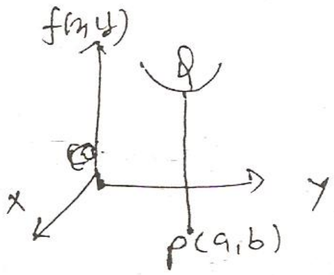
Maximum value



Maximum value of $f(x,y)$ at (a,b)

A fun $f(x,y)$ is said to have a maximum value at $x=a$, $y=b$, if $\exists$ small nbd of (a,b) such that $f(a,b) > f(a+h, b+k)$

Minimum value: A fn $f(x,y)$ is said to have a minimum value for $x=a$, $y=b$ if there exist a small nbd of (a,b) s.t. $f(a,b) < f(a+h, b+k)$



Working Rule

(i) Differentiate $f(x,y)$ and find

$$\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial^2 f}{\partial x^2}, \frac{\partial^2 f}{\partial x \partial y}, \frac{\partial^2 f}{\partial y^2}$$

(ii) Put $\frac{\partial f}{\partial x} = 0$ and $\frac{\partial f}{\partial y} = 0$ and solve these get the value of x and y.

(iii) Evaluate $r = \frac{\partial^2 f}{\partial x^2}$, $s = \frac{\partial^2 f}{\partial x \partial y}$, $t = \frac{\partial^2 f}{\partial y^2}$ for value of x and y.

(iv) If $rt - s^2 > 0$ and

(a) $r < 0$, then $f(x,y)$ has maximum value

(b) $r > 0$, then $f(x,y)$ has minimum value

(v) If $rt - s^2 < 0$, has no extremum value at x and y.