Name:________________________

Notesheet. Section 8.3 Part 2: Maxima and Minima of Function of Several Variables

Math 1220

Challenge 1. Consider the function $f(x,y) = (1-x^2)\sin(y)$. Compute the following

(a) $f_x(0, \frac{\pi}{2}), f_y(0, \frac{\pi}{2})$ and $f_x(1,0), f_y(1,0)$.

(b) $f_{xx}(0, \frac{\pi}{2}), f_{xy}(0, \frac{\pi}{2})$, and $f_{yy}(0, \frac{\pi}{2})$

(c) $f_{xx}(1,0), f_{xy}(1,0)$, and $f_{yy}(1,0)$

Theorem 2 (The Second Derivative Test)**.** Let $f(x,y)$ be a twice differentiable function with continuous second derivatives. Let

$$D(a,b) = f_{xx}(a,b)f_{yy}(a,b) - [f_{xy}(a,b)]^2$$

If $f_x = 0$ and $f_y = 0$,

(a) $D(a,b) > 0$ and $f_{xx}(a,b) < 0$, then

(b) $D(a,b) > 0$ and $f_{xx}(a,b) > 0$, then

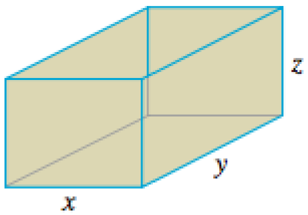
(c) $D(a,b) < 0$, then

(d) $D(a,b) = 0$, then

Challenge 3. Use the second derivative test to determine $f(x,y) = (1-x^2)\sin(y)$ classify the which type of critical point $(0, \frac{\pi}{2})$ and $(1,0)$ are.

Challenge 4. Let $f(x, y) = x^3 - 6xy + y^3$. find and classify all the critical points of $f(x, y)$.

Challenge 5. Find the dimensions that minimized the material used to construct an open rectangular box having a fixed volume of 32 cubic inches.



Challenge 6. Find the point (x, y) such that the sum of the distances squared from (x, y) to $(0, 0), (2, 1), (0, 3)$ is minimized. Hint: remember the distance formula from the Pythagorean theorem: $d^2 = (x - x_0)^2 + (y - y_0)^2$.