

(29) $f(x,y) = x^2 - 3y^2 - 2x + 6y$

$$f_x(x,y) = 2x - 2 \quad f_y(x,y) = -6y + 6$$

$f_x(x,y) = 0$ when $x=1$, $f_y(x,y) = 0$ when $y=1$.

Interior critical point is $(1,1)$

On the segment from $(0,0)$ to $(2,0)$, $y=0$ so

$$f(x,y) = f(x,0) = x^2 - 2x = f(x) \Rightarrow f'(x) = 2x - 2 = 0 \text{ when } x=1$$

Check $(1,0)$ *

On the segment from $(0,0)$ to $(0,2)$, $x=0$ so

$$f(x,y) = f(0,y) = -3y^2 + 6y = f(y) \Rightarrow f'(y) = -6y + 6 = 0 \text{ when } y=1$$

Check $(0,1)$

On the segment from $(2,0)$ to $(2,2)$, $x=2$ so

$$f(x,y) = f(2,y) = 4 - 3y^2 - 4 + 6y = -3y^2 + 6y. \text{ Check } (2,1)$$

On the segment from $(0,2)$ to $(2,2)$, $y=2$ so

$$f(x,y) = f(x,2) = x^2 - 12 - 2x + 12 = x^2 - 2x \text{ Check } (1,2)$$

See *

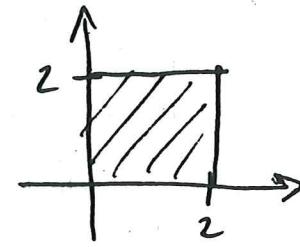
To check:

Interior critical points: $(1,1)$

Corner points of region: $(0,0), (2,0), (0,2), (2,2)$

Critical points of boundary segments:

$(1,0), (0,1), (1,2), (2,1)$.



Use in class
5/14/2018

Math 253

Section 15.8

Waterman

$$f(x,y) = x^2 - 3y^2 - 2x + 6y$$

(4)

$$f(1,1) = 1 - 3 - 2 + 6 = 2$$

$$f(0,0) = 0$$

$$f(2,0) = 4 - 4 = 0$$

$$f(0,2) = -12 + 12 = 0$$

$$f(2,2) = 4 - 12 - 4 + 12 = 0$$

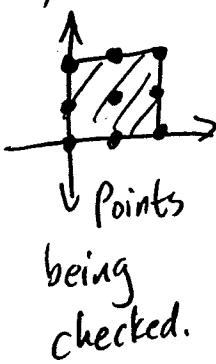
$$f(0,1) = -3 + 6 = 3$$

$$f(1,0) = 1 - 2 = -1$$

$$f(2,1) = 4 - 3 - 4 + 6 = 3$$

$$f(1,2) = 1 - 12 - 2 + 12 = -1$$

} The function is zero
at each corner of the
square!



The function has "absolute minimum of -1 at $(1,0)$ and $(1,2)$, and an absolute maximum of 3 at $(0,1)$ and $(2,1)$.