LESSON 16

MA 26100-FALL 2023

DR. HOOD

WARM UP

(Spring 23 Exam 2 #11)

Find the relative extrema of

$$f(x,y) = -\frac{2}{3}x^3 + 4xy - 2y^2 + 1$$

c.p.: $f_x = 0 = -2x^2 + 4y = 0$

$f_y = 0 = 4x - 4y = 0$

$x = y$

critical pts: (2,2) and (0,0)

2nd Deriv Test

$f_{xx} = -4x\big|_{x=2} = -8$

$f_{xy} = 4$

$f_{yy} = -4$

$D = (-8)(-4) - 4^2 > 0$

$f_{xx} < 0$

~~a) (3,2) local max~~

b) (1, 3) local min

~~c) (2, 3) local max~~

d) (2, 2) local min

e) (2, 2) local max

LESSON 16

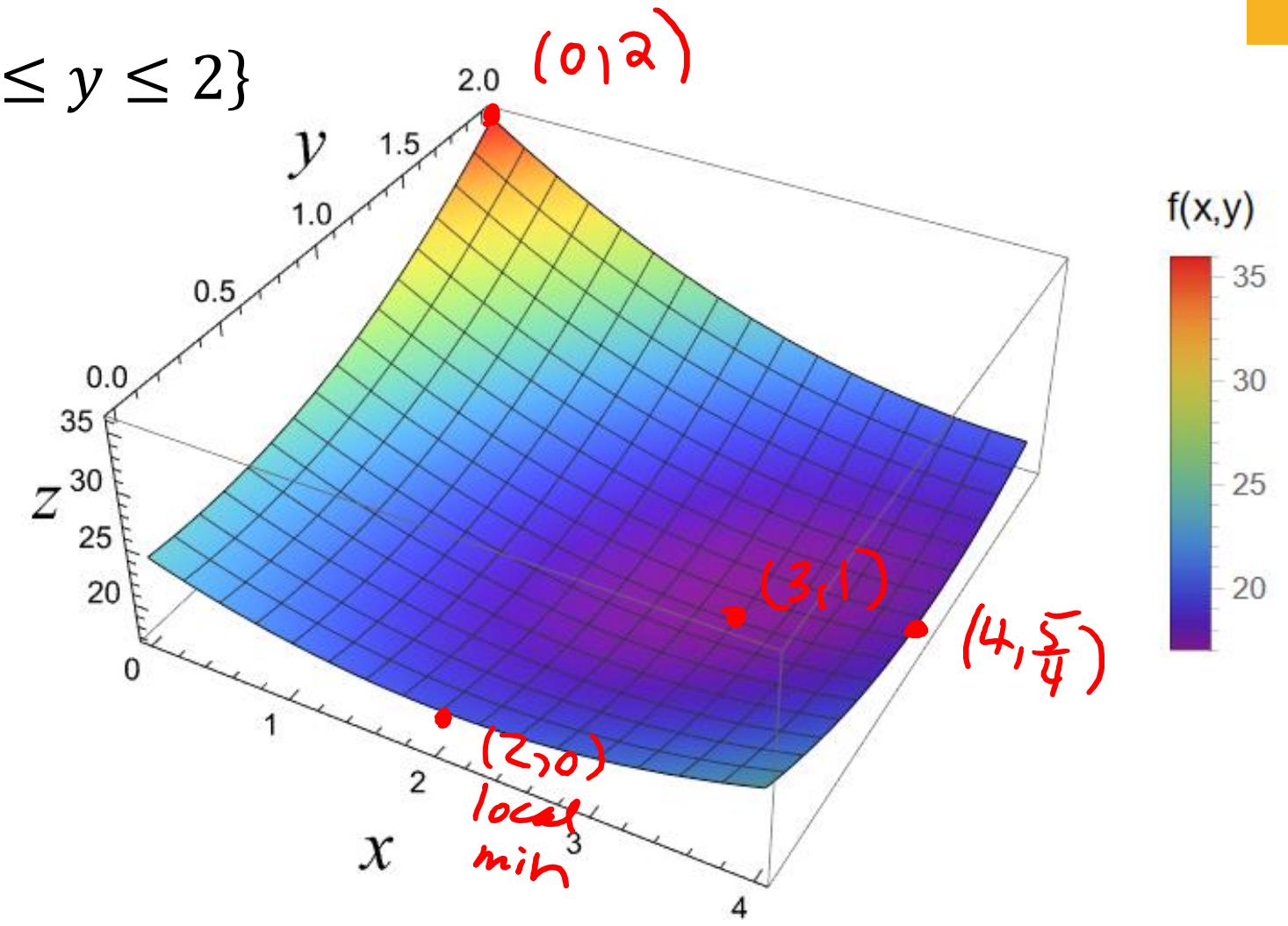
ABSOLUTE EXTREMA

Find the absolute extrema of

$$f(x,y) = x^2 - 2xy + 4y^2 - 4x - 2y + 24$$

Over the domain

$$D = \{(x,y): 0 \le x \le 4, 0 \le y \le 2\}$$

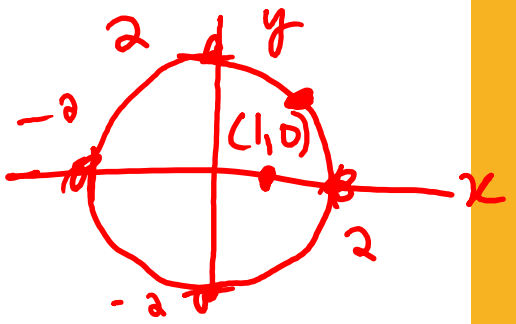


POLL 1

The function

$$f(x,y) = 9 - x^2 - y^2 + x$$

$f(1,0) = 9 \leftarrow$ global max



On the domain $D = \{(x,y): x^2 + y^2 \leq 4\}$ has a critical point at $(1,0)$. Are there any global extrema on the boundary of the domain? (Hint: check when $x^2 + y^2 = 4$)

$x = 2\cos t$, $y = 2\sin t$
$0 \leq t \leq 2\pi$

a) Global max

b) Global min

c) Global max and Global min

d) No global extrema on the boundary of D

$f(t) = 9 - 4\cos^2 t - 4\sin^2 t + 2\cos t$

$= 5 + 2\cos t$

$f'(t) = -2\sin(t) = 0$

$t = 0 \quad t = \pi$

@ $t = 0$ $f(2,0) = 9 - 4 + 2 = 7$

@ $t = \pi$
$f(-2,0) = 3$
global min

POLL 2

(Spring 2023 Exam 2 #4)

The x-coordinate of the point on the plane $z = x + y$ that is closest to the point $(1, 1, 1)$ is equal to:

a) $\frac{1}{3}$

b) $\frac{2}{3}$

c) $\frac{3}{4}$

d) $\frac{5}{4}$

e) $\frac{1}{4}$

POLL 3

Classify the critical point $(0, 0)$ of the function

$$f(x, y) = x^3 y$$

a) Local max
b) Local min
c) Saddle point
d) Not enough information

MUDDIEST POINT

What was the muddiest point from today's lecture?

a) Boundary of Domain
b) Evaluating on the Boundary
c) Minimize distance to a plane
d) None – understood everything today