Lesson 26 - Functions of Several Variables

I. Evaluating Functions of Several Variables

II. Domain and Range

III. Level Curves

Exam 3

See memo in Brightspace

Exam 3

Posted Oct 30, 2023 10:38 AM

Exam 3 is Wednesday, November 8 from 6:30pm-7:30pm. The location of the exam will depend on your instructor (and please note that these locations are different than the first 2 exams):

Ben Doyle: LILY 1105

Victor Hughes: CL50 224

Jakayla Robbins: LILY 1105 New room!

Alexandra Cuadra: CL50 224

Dave Norris: CL50 224

There is an exam memo in Brightspace under Contents->Exam Information with more detailed information about the exam. You will be emailed a seating assignment closer to the exam date.

Attachment(s):

Exam3Memo.pdf (41.65 KB)

I. Evaluating $f(x,y)$

Ex Compute the function value

a) $f(x,y) = \ln(xy)$

$$f(e^2, e^3) = \ln(e^2 \cdot e^3) = \ln(e^5) = 5$$

b) $f(x,y) = \sin(x+y)$

$$f\left(\frac{\pi}{3}, \frac{\pi}{6}\right) = \sin\left(\frac{\pi}{3} + \frac{\pi}{6}\right) = \sin\left(\frac{\pi}{2}\right) = 1$$

$\frac{2\pi}{6} + \frac{\pi}{6}$

$\frac{3\pi}{6}$

$\frac{\pi}{2}$

II. Domain and Range

Set of allowable inputs

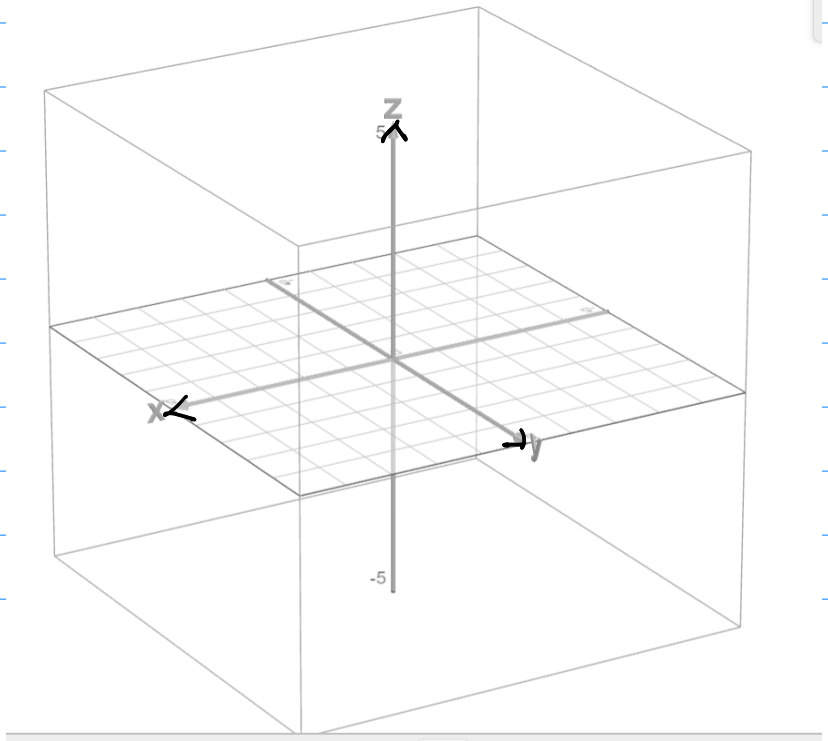
Set of possible outputs

Axis system for fctns of 2 variables

If you want to graph $f(x,y)$

$$z = f(x,y)$$

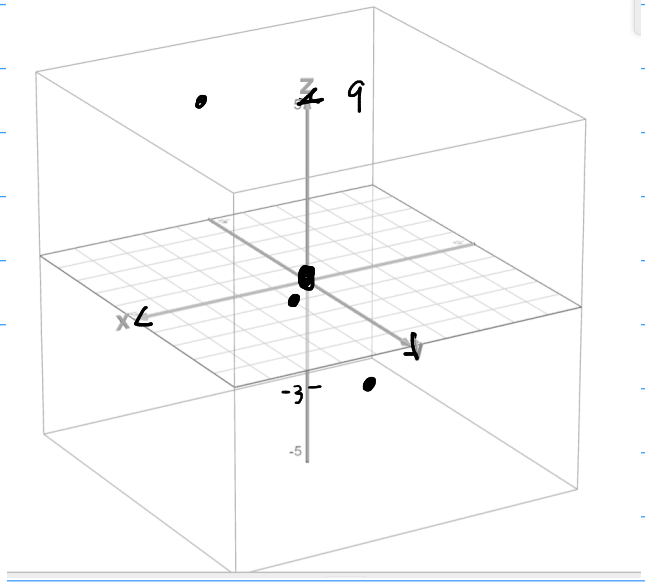
xyz-space

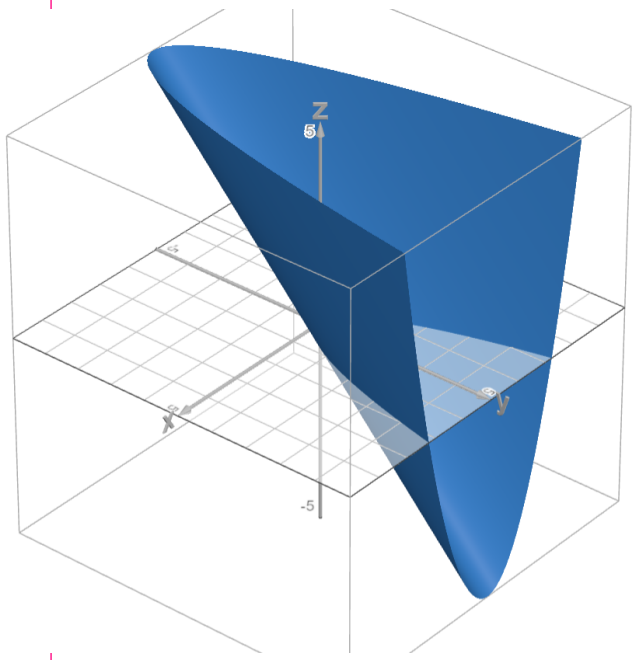


To graph $f(x,y)$, we graph $z = f(x,y)$

So if $f(x,y) = x^2 - y$. Then some points on the graph of this function would be

$(0,0,0)$
$(1,1,0)$
$(0,3,-3)$
$(3,0,9)$





↖ graph of $z = f(x,y) = x^2 - y$

Domain For $f(x,y)$

Domain of f: $D_f = \{(x,y) \mid f(x,y) \text{ is a real \#}\}$

Ex $h(x,y) = \sqrt{x^2+y^2-4}$

≥ 0

$D_h: \{(x,y) \mid x^2+y^2-4 \geq 0\}$

$= \{(x,y) \mid x^2+y^2 \geq 4\}$

Things to watch for with domain

(1) Don't divide by 0

(2) Don't put negatives under even roots $\sqrt{\ }$, $\sqrt[4]{\ }$, $\sqrt[6]{\ }$, etc

input ≥ 0

(3) Don't put 0 or negatives in logs

input > 0

Range: The set of all possible z values

$$h(x,y) = \sqrt{x^2+y^2-4}$$

$R_h: [0, \infty)$

Things to consider about range:

(1) $R_{e^x}: (0, \infty)$

(2) $R_{\ln(x)}: (-\infty, \infty)$

(3) $R_{\substack{\sin(x) \\ \text{or} \\ \cos(x)}}: [-1, 1]$

(4) $R_{\sqrt{x}}: [0, \infty)$

Ex Find the domain of $f_2(x,y) = \dfrac{\ln(x-2)}{\sqrt{y-1}}$

ln

$x-2 > 0$

$x > 2$

$\sqrt{\ }$

$y-1 \geq 0$

$y \geq 1$

Denom.

$\sqrt{y-1} \neq 0$

$y-1 \neq 0$

$y \neq 1$

$y > 1$

$D_{f_2}: \{(x,y) \mid x > 2 \text{ and } y > 1\}$

II. Level Curves

Like contour maps.

(D) A level curve of $f(x,y)$ is the graph of

$$f(x,y) = C$$

for some constant C

Notice: No z. This graph is in xy-plane

Ex Describe the level curves

a) $f(x,y) = 2\sqrt{x-5y^2}$

$$2\sqrt{x-5y^2} = C$$

$$\sqrt{x-5y^2} = C/2$$

$$x-5y^2 = (C/2)^2$$

$$x-5y^2 = k$$

sideways parabola. Only y^2

b) $f(x,y) = 2(x-4)^2 + 2(y+3)^2$

$$C = 2(x-4)^2 + 2(y+3)^2$$

$$(x-4)^2 + (y+3)^2 = \frac{C}{2}$$

x^2, y^2 same 2 for both

circle, radius $\sqrt{\frac{C}{2}}$ center $(4,-3)$