Multivariable function (Domain, Range, Level curve, contour map)

Friday, May 29, 2020 4:11 PM

① $g(x) = x+1$ — Ind- 1, dep. 1. — 2-D. (Total No. of Variable)

② $f(x,y) = x^2+y^2$

Independent V. — 2
dependent V. — 1.

{Domain. 1 axis-D. 2-D.}

Domain — 2D. [(x, y) — an ordered pair]

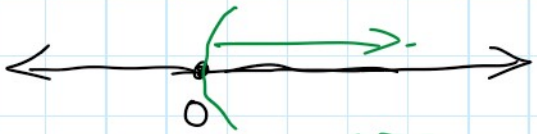
Graph f^n — 3D.

③ $h(x,y,z) = \frac{x^2+y^2}{z-3}$ — Domain — (3-D) — No. of independent

$w = \frac{x^2+y^2}{z-3}$ — Graph :- 4-D

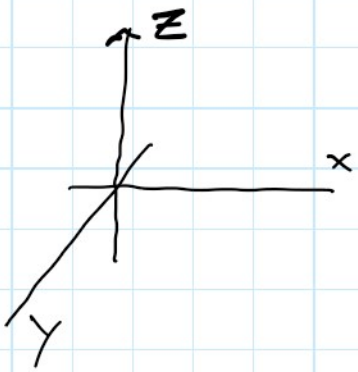
To Graph a function we must have one dimension more than the independent variable.

To graph a domain of a function we must have the same dimension as of independent variable.



$x \geq 0$ $\quad y = \sqrt{x}$

Ex: $f(x,y,z) = \sqrt{x^2+2y^2+3z^2}$



4-D graph of f^n.

3-D Domain $\boxed{w \geq 0}$

(x,y,z)

$x^2+2y^2+3z^2 \geq 0$

Domain: $\{(x,y,z) \mid x^2+2y^2+3z^2 \geq 0\}$

$\subseteq \mathbb{R} \times \mathbb{R} \times \mathbb{R}$

{X = {1, 2, 3}
Y = {4, 5}

$(x, y, z) \in \mathbb{R} \times \mathbb{R} \times \mathbb{R}$

$X = \{1, 2, 3\}$
$Y = \{4, 5\}$
$(1,4), (2,5), (3,4)$

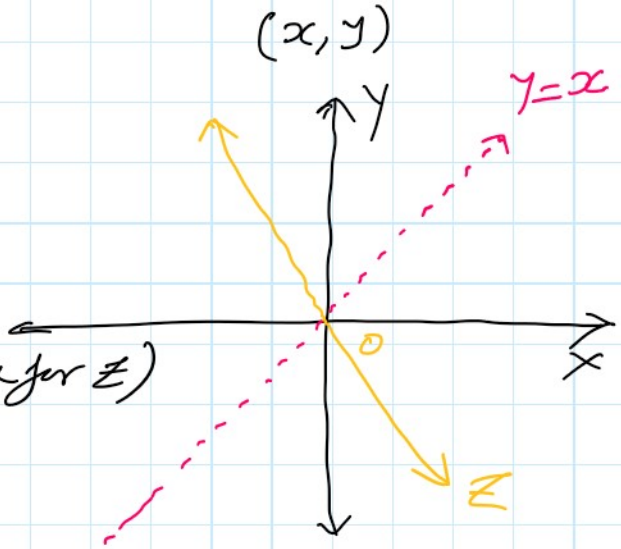
Identify the Domain:- & Range

1) $f(x,y) = \dfrac{xy}{x-y}$

Domain:- $x - y \neq 0$

$y \neq x$.

$D. = \{(x,y) \mid y \neq x\}$



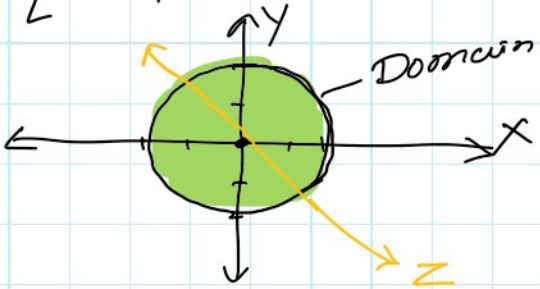
Range:- output (all value for z)

$R: (z / -\infty < z < \infty)$

2) $g(x,y) = \sqrt{4 - x^2 - y^2}$ $\quad z = g(x,y)$

Radius?? $D: \{(x,y) \mid 0 \leq x^2 + y^2 \leq 4\}$

$R: \{z \mid 0 \leq z \leq 2\}$



Domain

$0 \leq x^2 + y^2 \leq 4$

$0 \geq -x^2 - y^2 \geq -4$

$4 \geq 4 - x^2 - y^2 \geq 0$

$2 \geq \sqrt{4 - x^2 - y^2} \geq 0$

$2 \geq z \geq 0$

Q. $f(x,y) = \dfrac{xy}{x^2 - y^2}$

$x^2 - y^2 \neq 0$

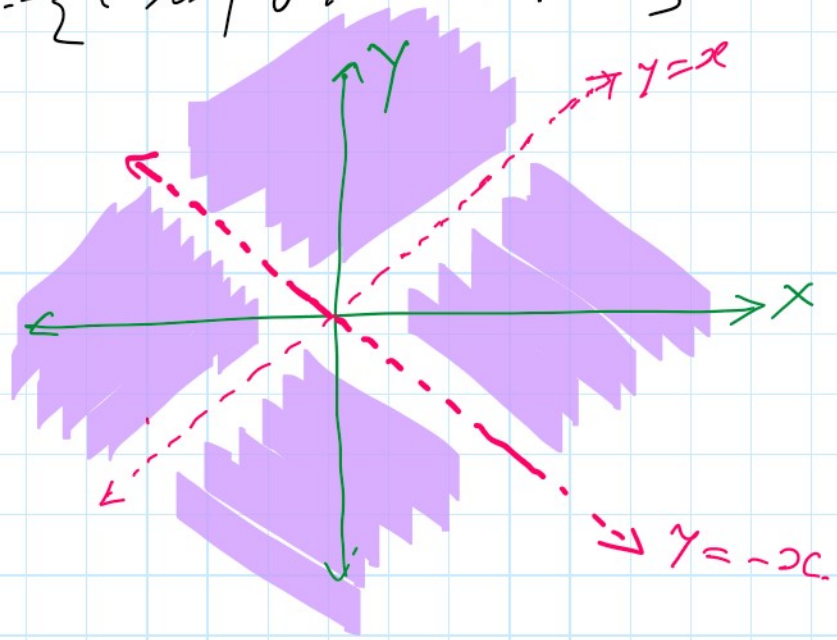
$x^2 \neq y^2$ $\quad |y| = |x|$

$y \neq x$ & $y \neq -x$

$\{(x,y) \mid y \neq x \;\&\; y \neq -x\}$

$y \neq x$ &

Domain :- $\{(x,y) \mid y \neq x \ \& \ y \neq -x\}$



j) $f(x,y) = \dfrac{\ln(y-x)}{\sqrt{x-y+1}}$

$\begin{cases} y-1 < x \\ x < y \end{cases}$ Dev.

$x-y+1 > 0$

$x+1 > y$

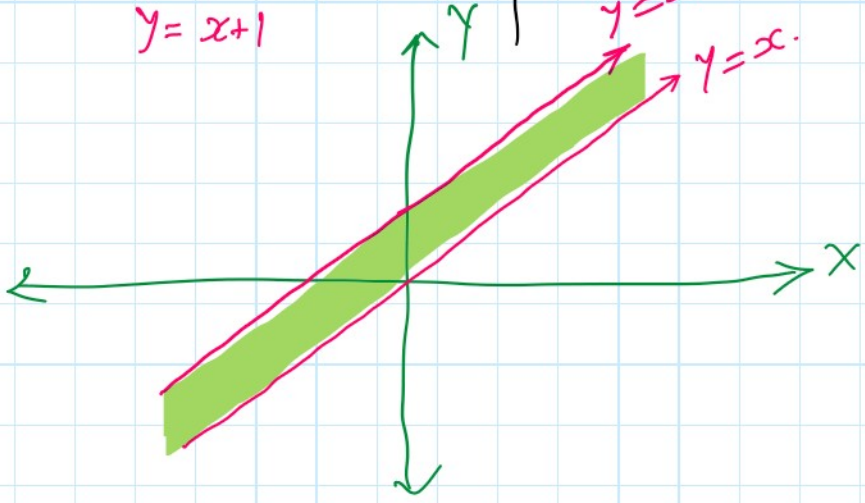
$\boxed{y < x+1}$

$y = x+1$

$y-x > 0$

$\boxed{y > x}$

$y = x$

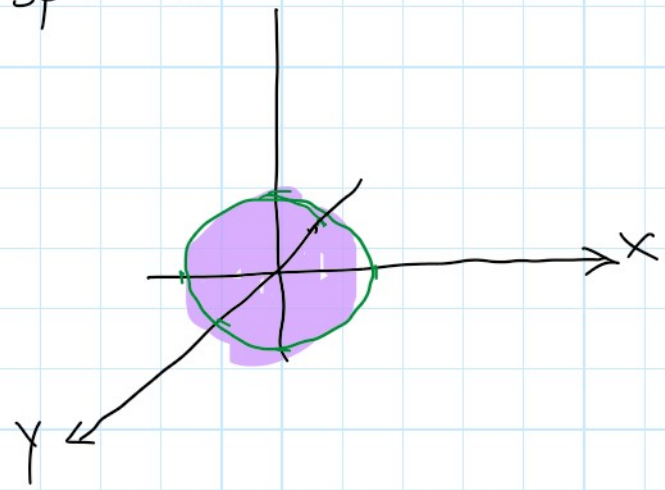


Q $f(x,y,z) = \sqrt{9-x^2-y^2-z^2} = \sqrt{9-(x^2+y^2+z^2)}$

$D: \{(x,y,z) \mid x^2+y^2+z^2 \le 9\}$

Bola (solid sphere)

Range: $0 \le \omega \le 3$.



Q $f(x,y,z) = \dfrac{\sqrt{4-x^2-y^2}}{z-3}$.

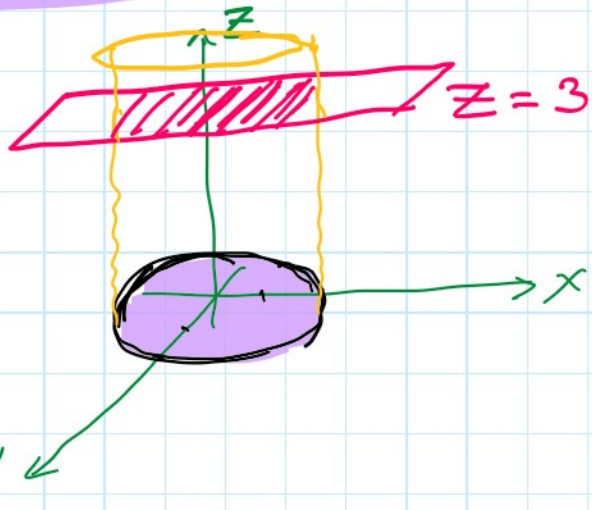
$4-x^2-y^2 \ge 0$

$x^2+y^2 \le 4$ — (1)

$z \ne 3$ — (2)

$D: \{(x,y,z) \mid x^2+y^2 \le 4,\ z \ne 3\}$

3 - independent variable
3-D required to show domain.



How to graph:-

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

1) $f(x,y) = z$
2) Try to understand the surface.
3) Computer.

$f(x) = x^2$

$y = f(x)$

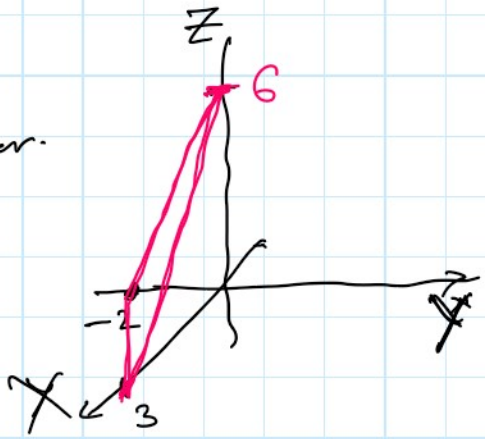
$y = x^2$

$z = 6 - 2x + 3y$

$2x - 3y + z = 6$

Eqn of a plane. — vector.

$$\vec{n} = \begin{pmatrix} 2 \\ -3 \\ 1 \end{pmatrix}$$



$x, y = 0$

$z = 6$

$x, z = 0$

$y = -2$

$y, z = 0$

$x = 3$

Q.1. $f(x,y) = 9 - x^2 - y^2$

Q.2 $g(x,y) = \frac{1}{2}\sqrt{36 - 9x^2 - 36y^2}$