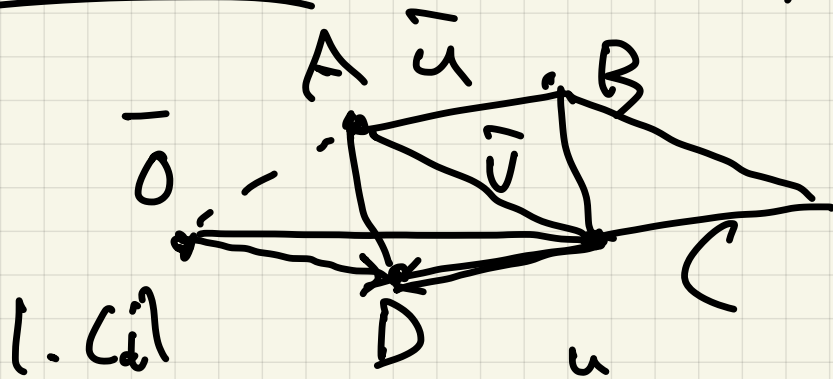


2/14/Calc3 Exam

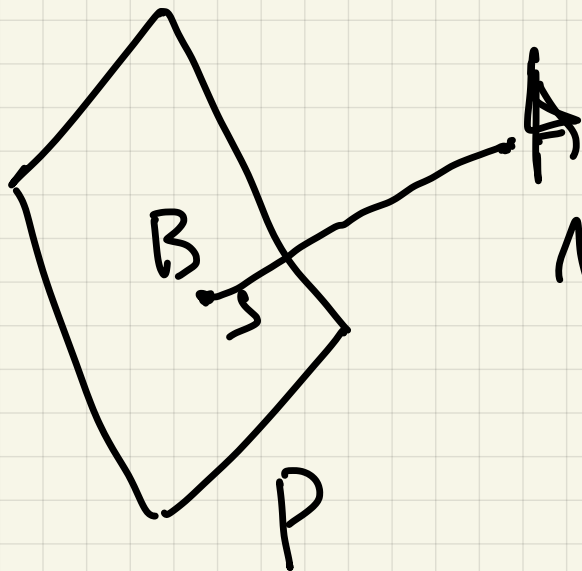


$$\overrightarrow{OC} - \overrightarrow{AB}$$

$$\overrightarrow{OA} + \underbrace{\overrightarrow{AC}}_v - \overrightarrow{AB}$$

$$\langle 1, -5, 4 \rangle$$

2 (e)



$$A = (5, -3, 11)$$

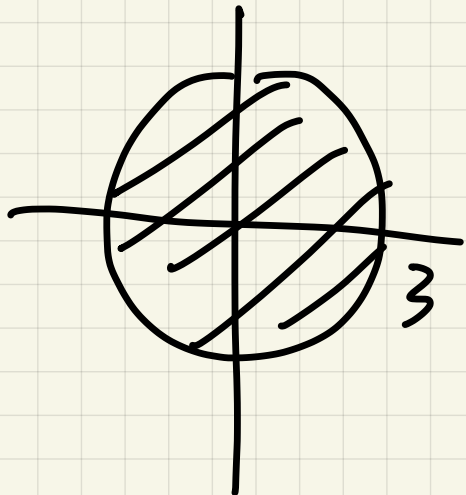
13.) Functions of 2 variables

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

Domain / range / graph

Ex 1 $z = f(x, y) = \sqrt{9 - x^2 - y^2}$

domain $9 - x^2 - y^2 \geq 0$
 $9 \geq x^2 + y^2$

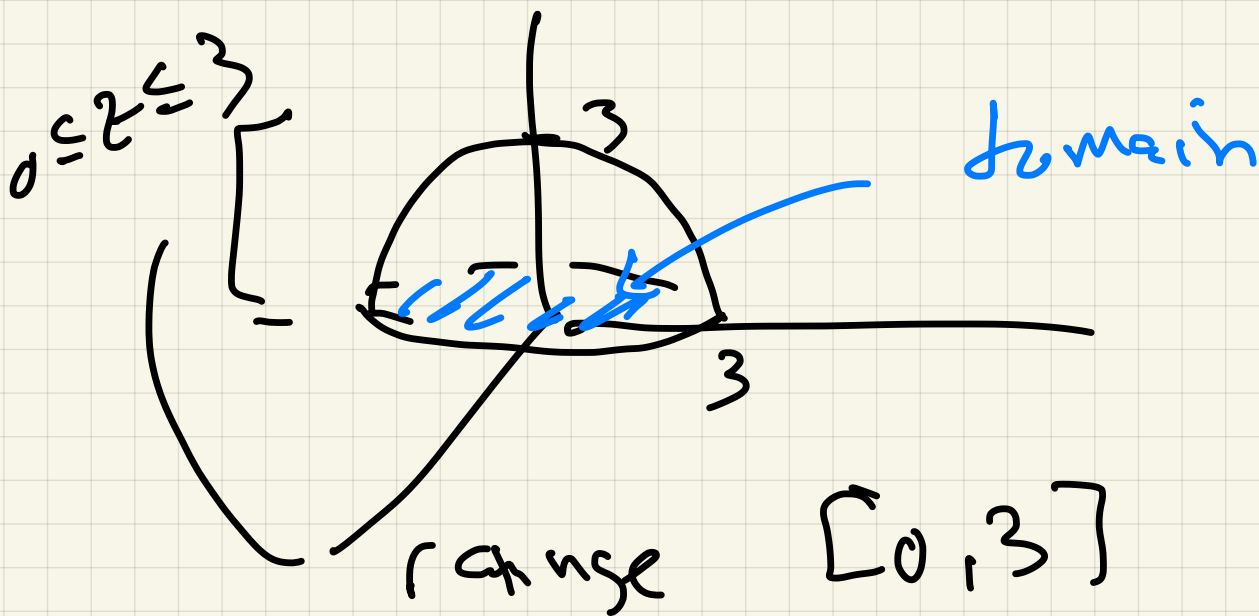


Graph

$$z = \sqrt{9 - x^2 - y^2}$$

$$z^2 = 9 - x^2 - y^2$$

$$x^2 + y^2 + z^2 = 9, \quad z \geq 0$$

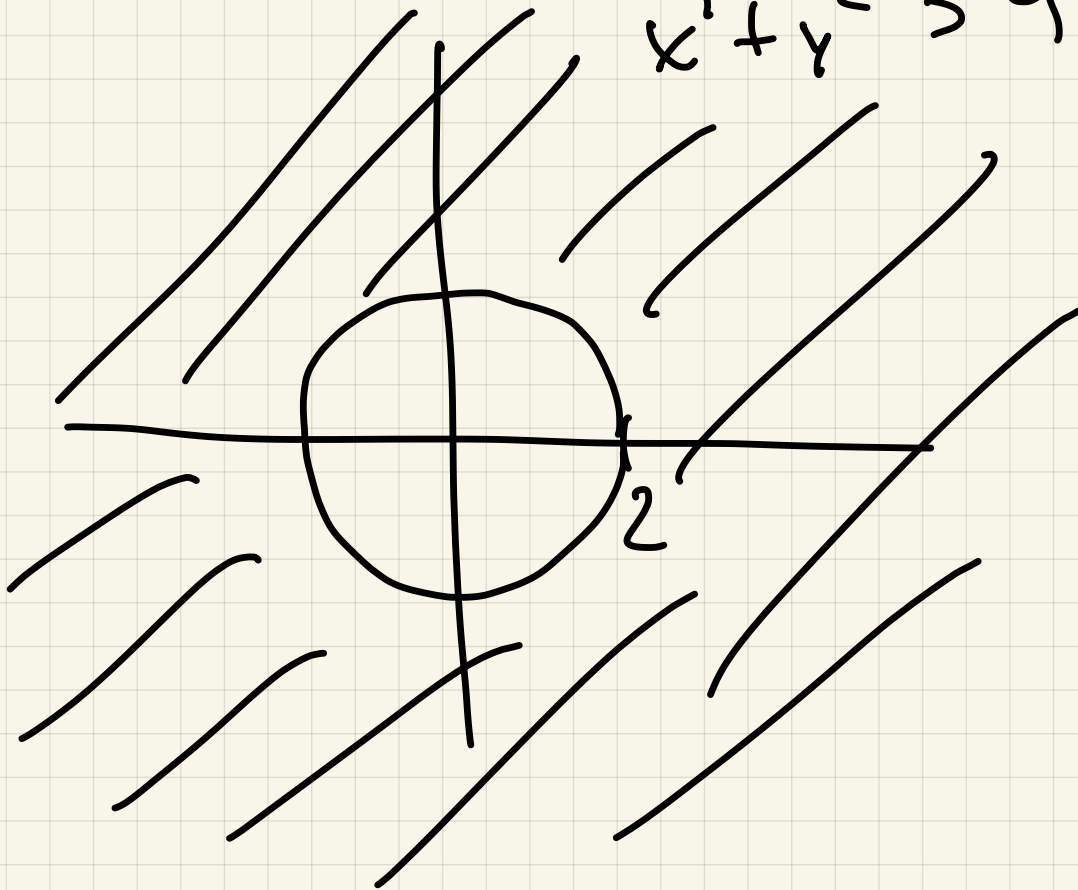


Ex2 $f(x,y) = \frac{1}{\sqrt{x^2+y^2-4}}$

Domain

$$x^2 + y^2 - 4 > 0$$

$$x^2 + y^2 > 4$$



Defns : Domain $f = \{ (x,y) : \left. \begin{array}{l} f(x,y) \\ \text{is} \\ \text{defined} \end{array} \right\}$

Graph : $\{ (x,y,z) : z = f(x,y) \}$

Range : $\{ z : z = f(x,y) \text{ some } (x,y) \}$

Graph: Can make a contour map by sketching

$$\{(x, y) : z = f(x, y) = \text{constant}\}$$

level sets

$$f(x, y) = \frac{1}{\sqrt{x^2 + y^2 - 4}} = 0$$

$z = 0$: empty

$z = 1$

$$\frac{1}{\sqrt{x^2 + y^2 - 4}} = 1 \Leftrightarrow 5$$

$$x^2 + y^2 - 4 = 1$$

$$x^2 + y^2 = 5$$

$z = 5$

$$x^2 + y^2 - 4 = \frac{1}{25}$$

$$x^2 + y^2 = 4 + \frac{1}{25}$$

$$\underline{z = 10}$$

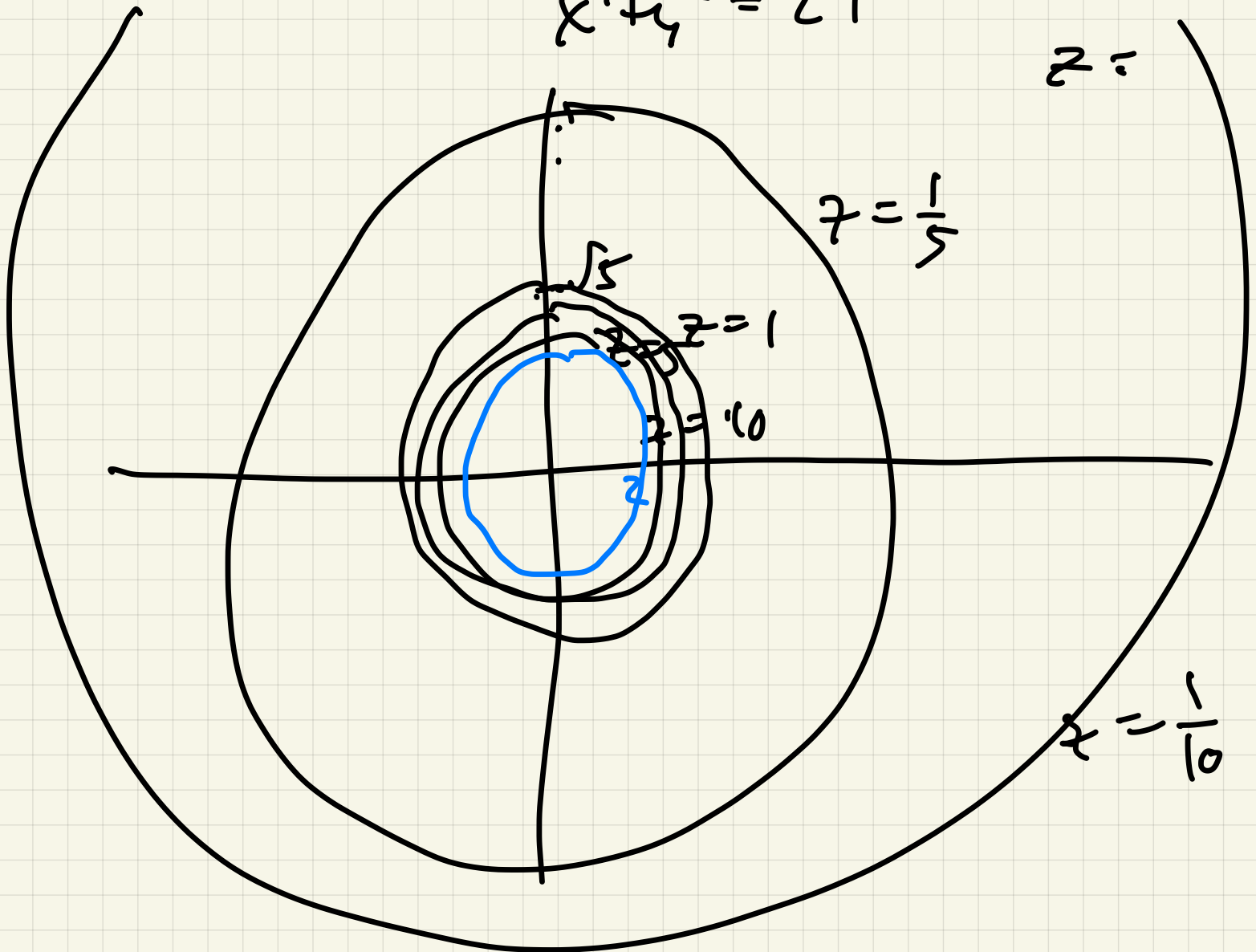
$$x^2 + y^2 = 4 + \frac{1}{100}$$

$$z = \frac{1}{5}$$

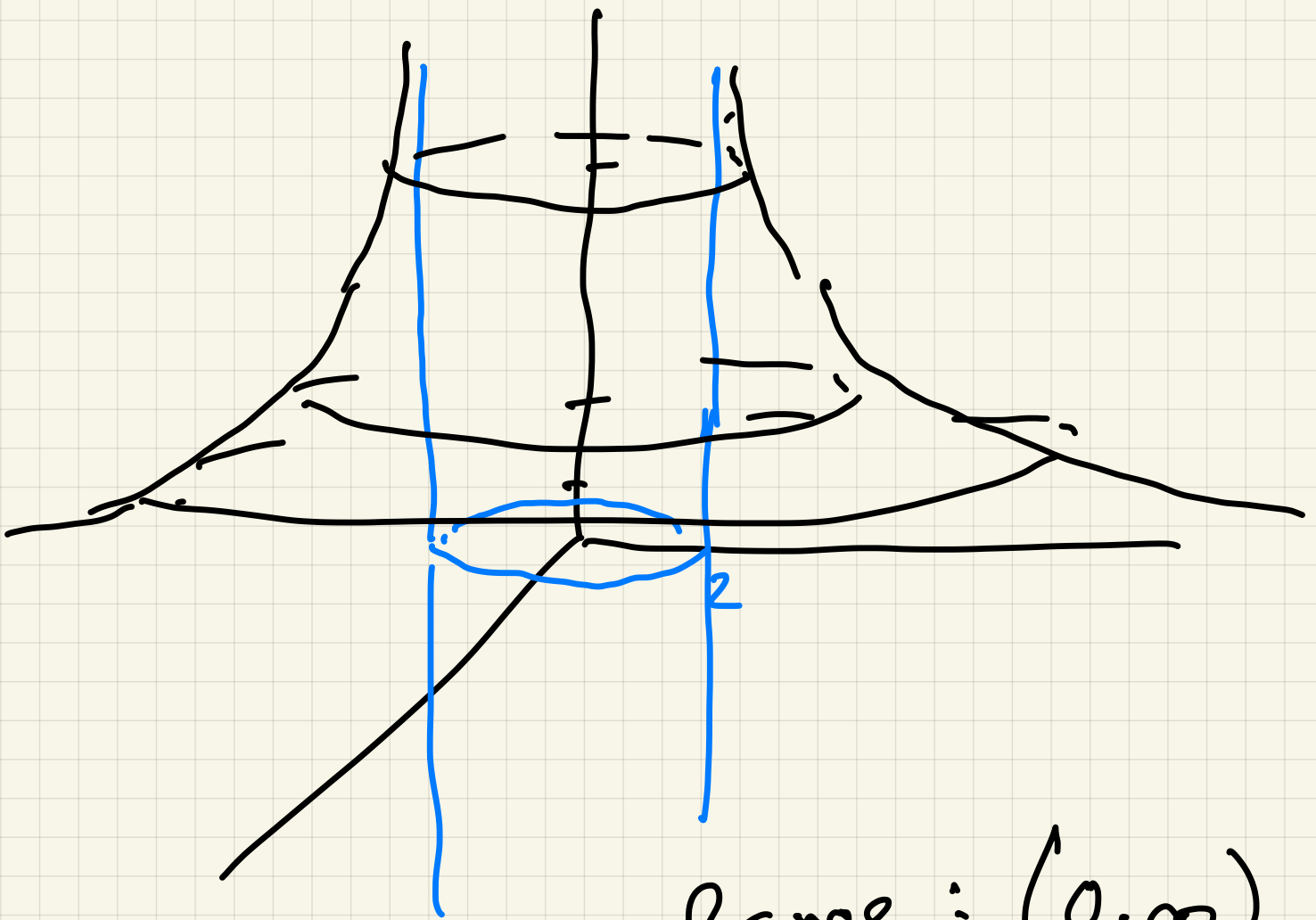
$$x^2 + y^2 - 4 = 25$$

$$x^2 + y^2 = 29$$

$$z =$$



put together



Range : $(0, \infty)$

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

Domain = $\mathbb{R}^2 = (\text{all } (x, y))$

Range $(-\infty, \infty)$

Graph? level sets

$$z = -2x + 2$$

$$z = 0 : x = 1$$

$$z = -1 : x = 3/2$$

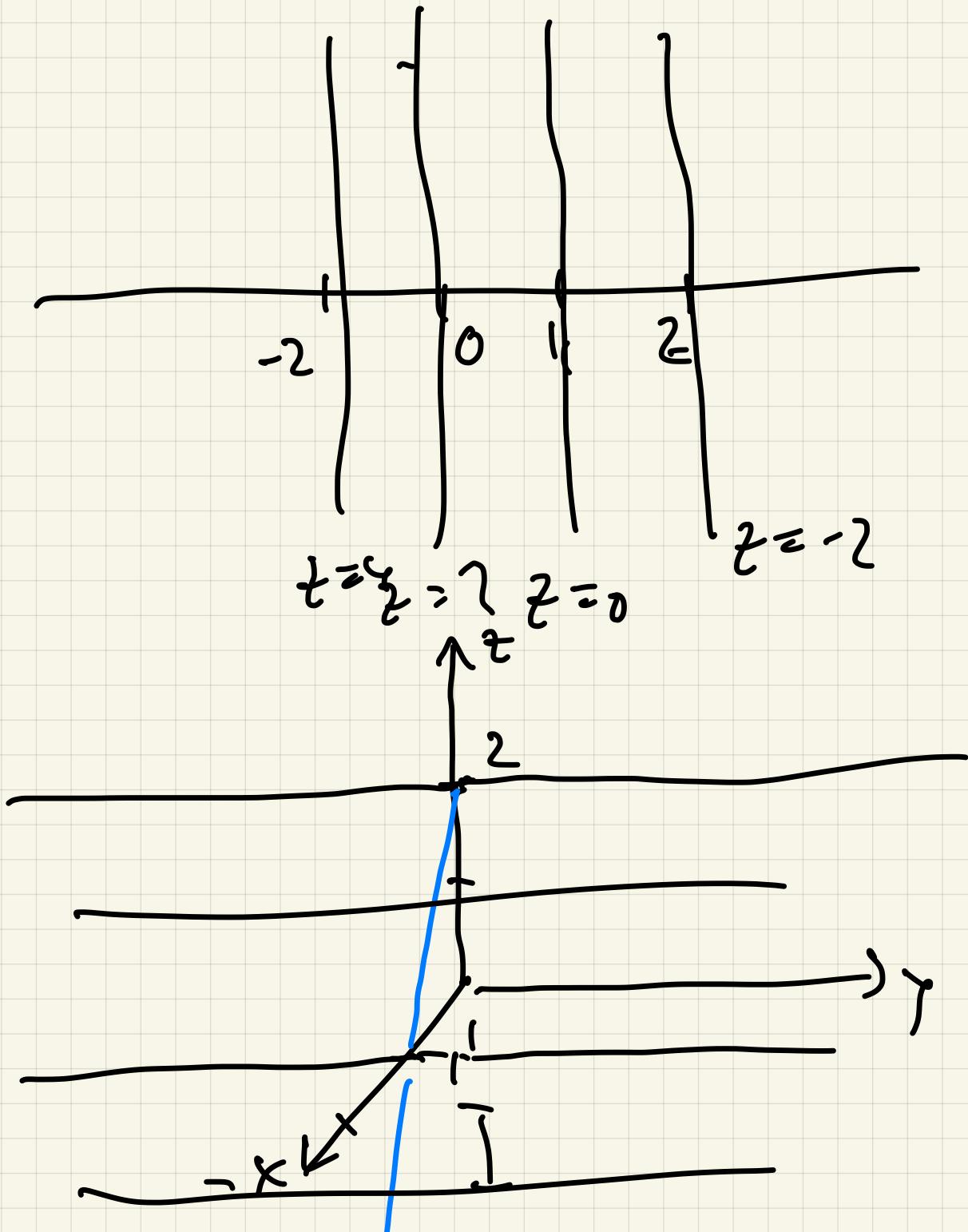
$$z = -2 : x = 2$$

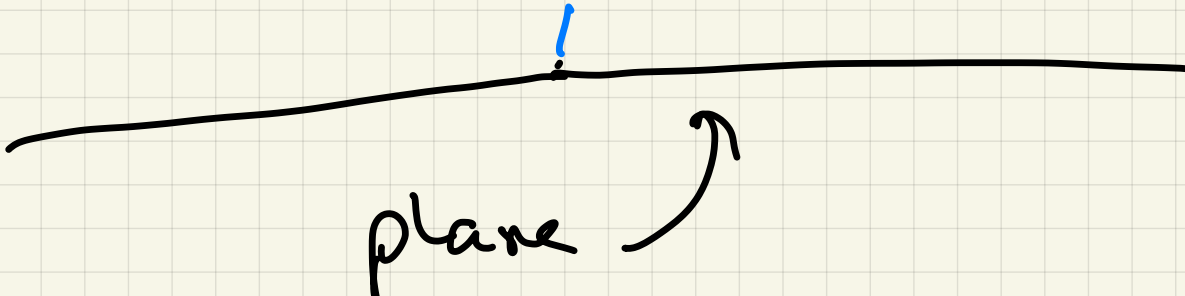
$$z = 2 : x = 0$$

$$-1 = -2x + 2$$

$$-3 = -2x$$

$$3/2 = x$$





of course! $z = -2x + 2$

plane, normal vector $\langle 2, 0, 1 \rangle$
 $2x + z = 2$

Ex 9

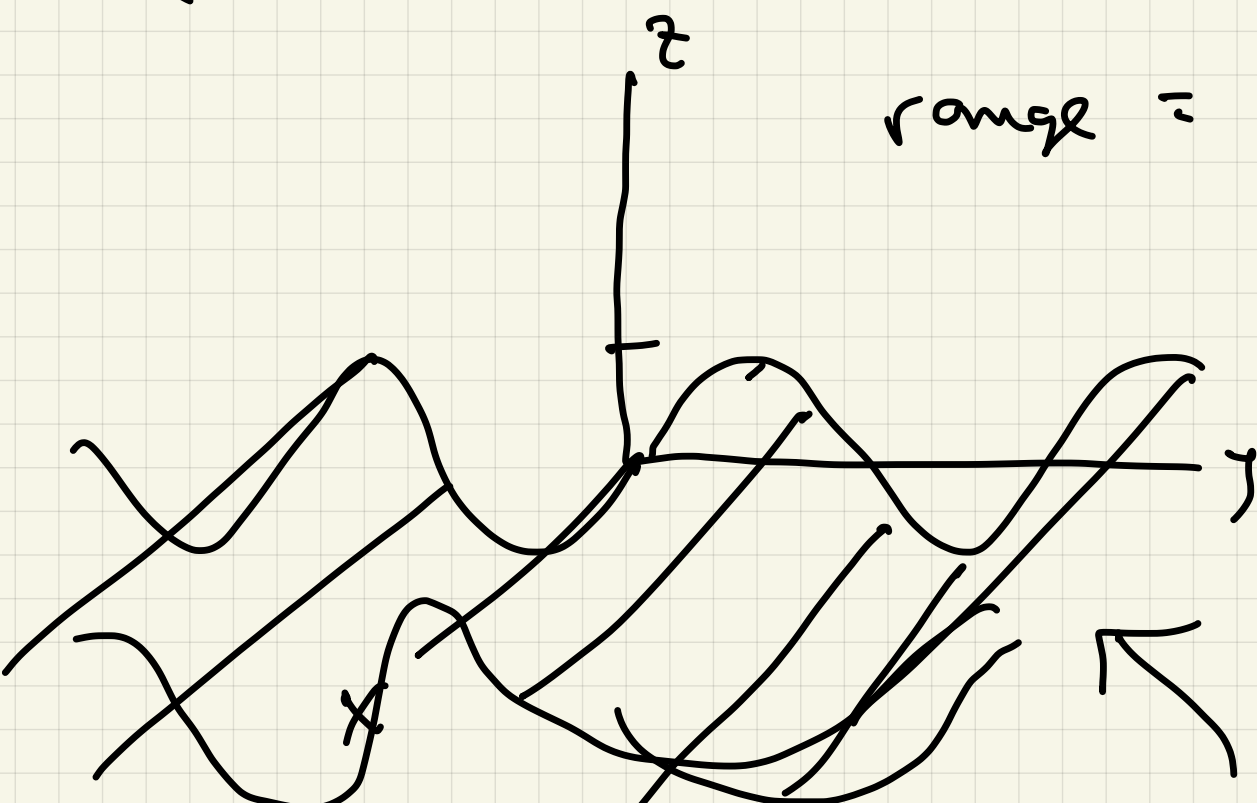
$z = \sin(y)$

dom = \mathbb{R}^2

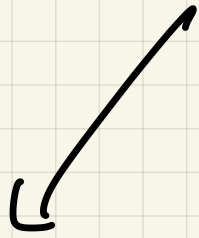
(a)

Cylinder (S(1.6))

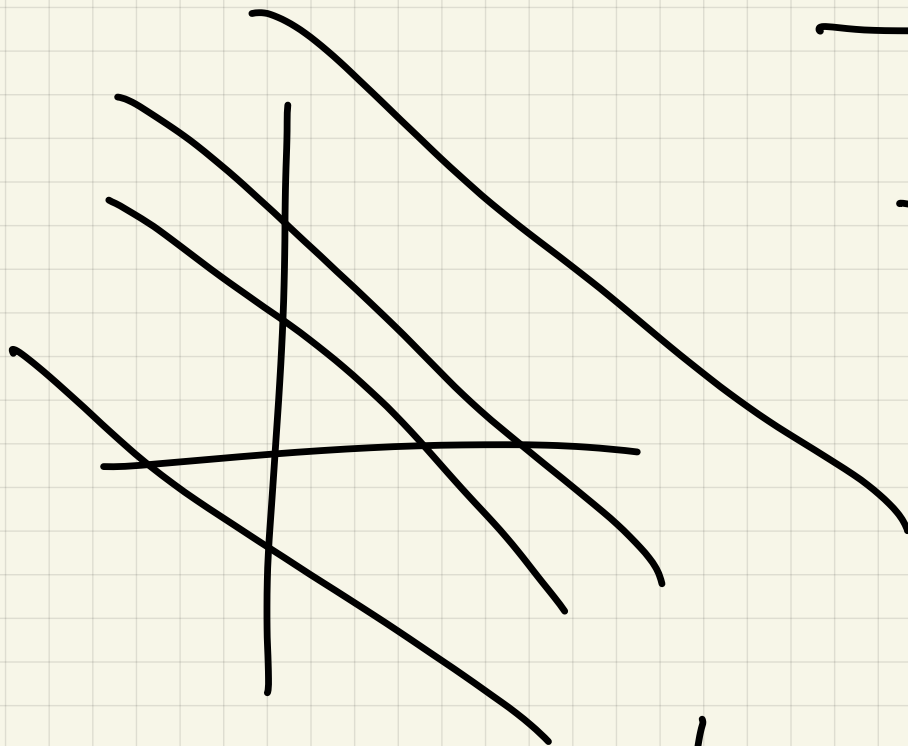
range = $[-1, 1]$



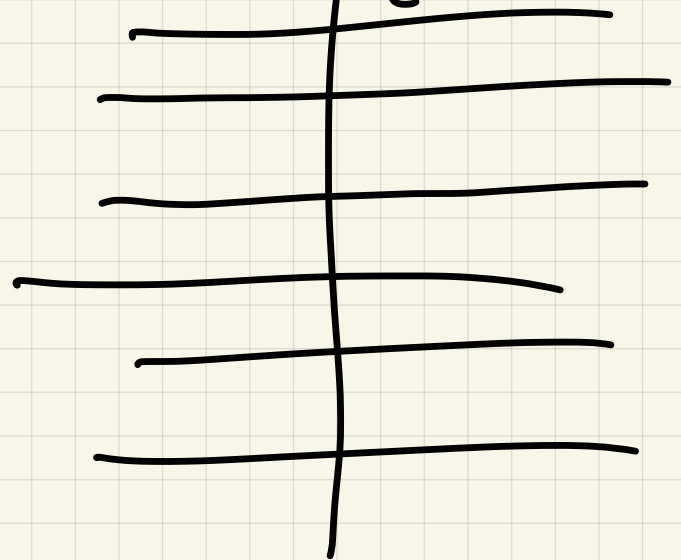
(b) $z = \sin(x+y)$



level sets
 $x+y = \text{const}$

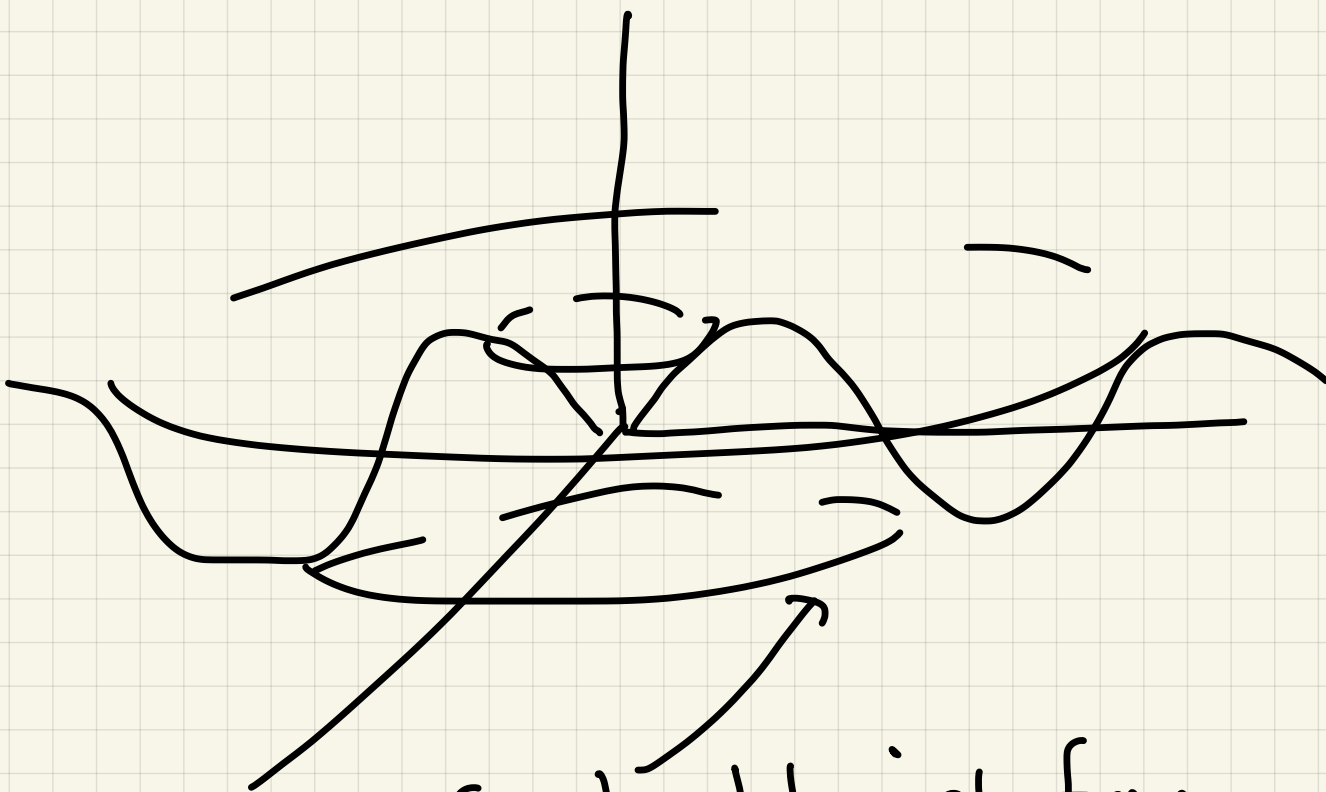
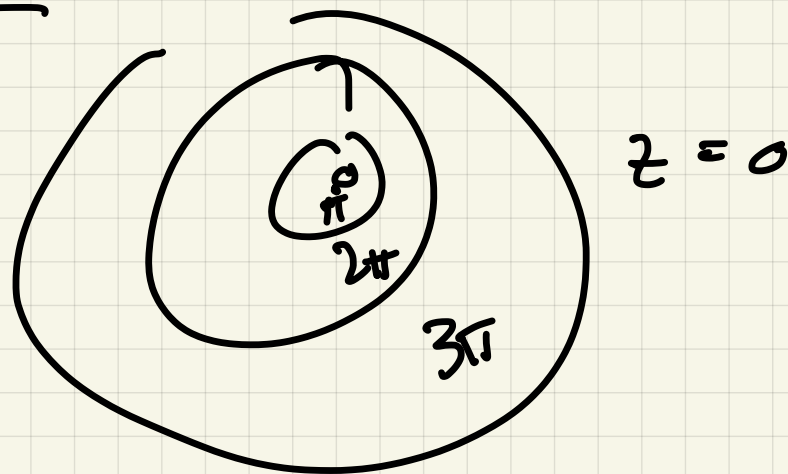


level set
 $z = \text{const}$



$$(c) \quad z = \sin(\sqrt{x^2 + y^2})$$

level sets: $z = \text{const}$



Graph obtained from
revolving $z = \sin y$ ($y \geq 0$)
about the z -axis.