

1/14/ Calc 3

Math 30524

Contact Info:

Scott Nallet

310 Tucker

s.nallet@tcu.edu

817-257-6339

Off hrs: T-F 2-5

Text:

University Calculus
"Early transcendentals"

Hess-Heil-

Calculator: TI-84 plus

TCU Online
Weekly Planner - website

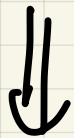
<u>Grading:</u>	HW	10	
(No makeups)	→ Q	10	
	Ex 1	15	2/18
	Ex 2	15	3/18
	Ex 3	15	9/15
	<u>Final</u>		
	<u>Thursday</u>	5/8	
			11-130

Demographics:

<u>Majors</u>	10	Engn
	0	Math
	1	Phys
	1	CSCI / data science
	1	Finance
<u>Freshman</u>	0	
<u>linear</u>	3	

Overview:

Calc 1



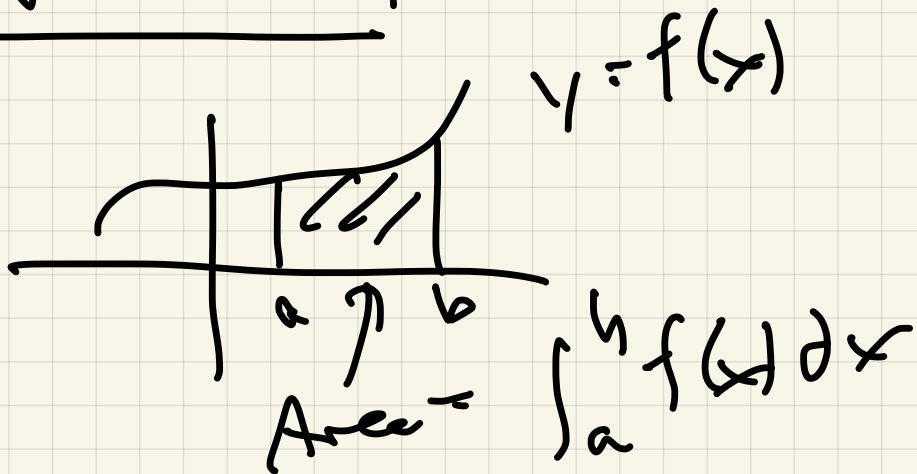
Calc 2



Calc 3

Most Useful functions have multiple inputs/outputs

$$V = \pi r^2 h$$



Limits

Derivative

compute
graph
rate change
max/min

Integrals

compute
applies

Power Series

Our course

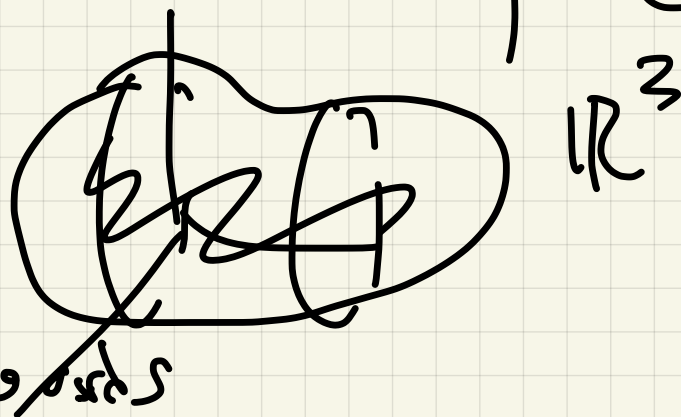
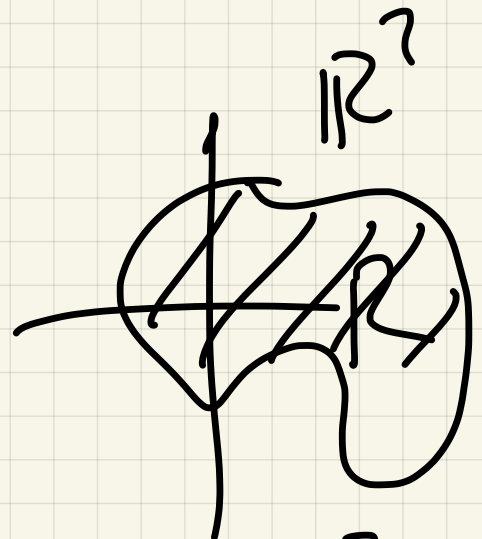
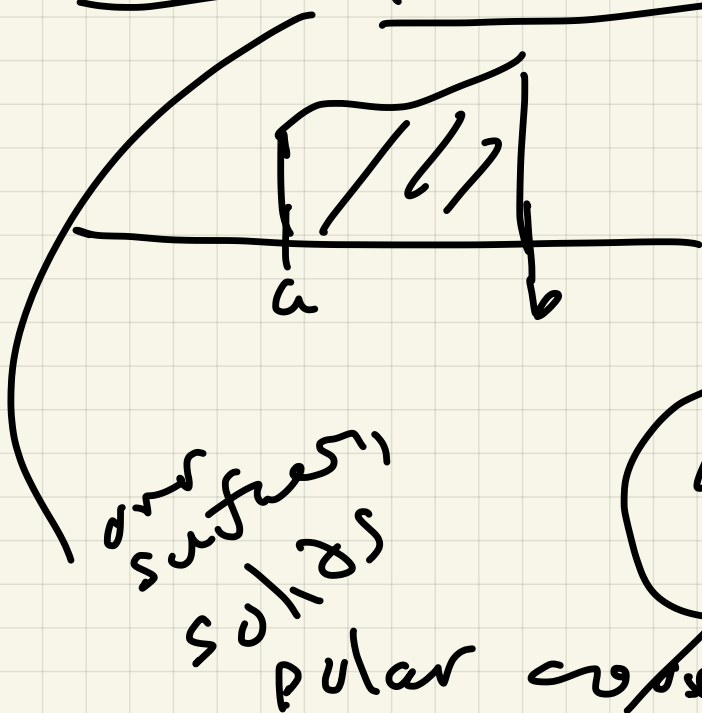
Ch 1 Vectors in 2D or 3D - products
lines + planes
surfaces

Ch 12 $y = f(x)$ y is a vector
 x is number

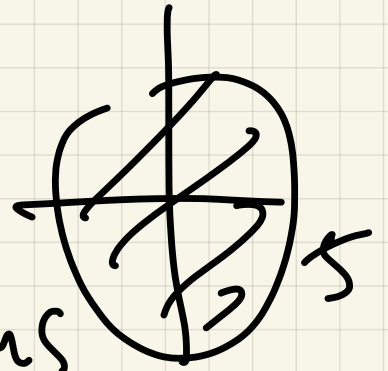
Ch 13 $y = f(x)$ y is a number
 x is vector

Partial derivatives, chain rule,
max/min, rate of change

Ch 14 Integrals

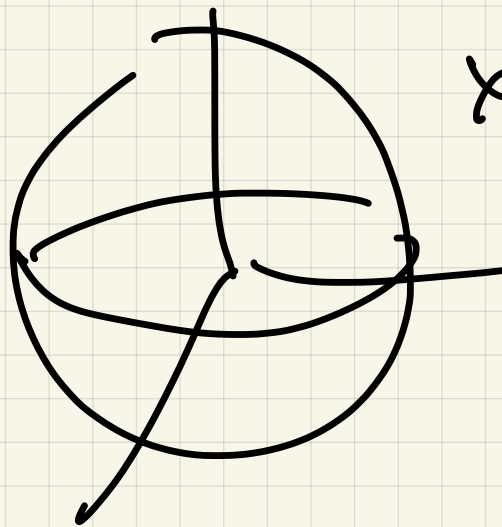


cylindrical curves
spherical curves



Ch 15 Vector Calculus

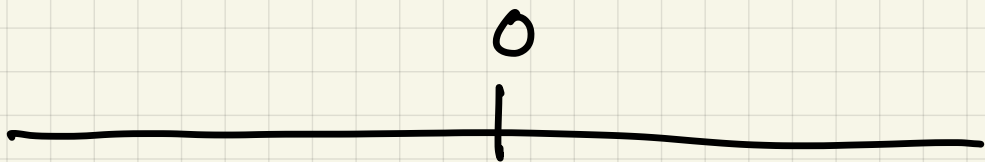
Vector fields, integrate over

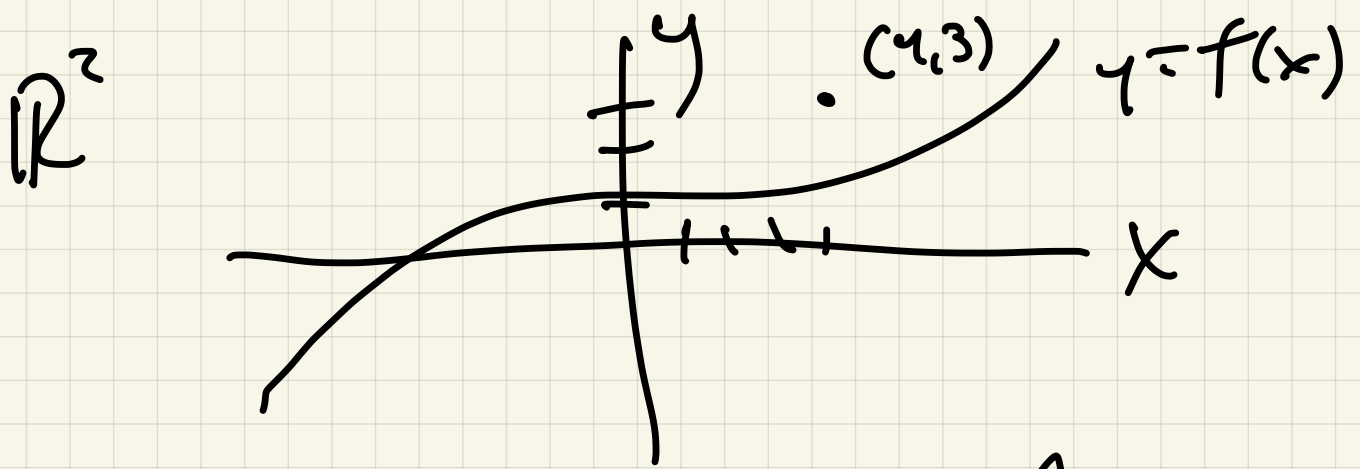


$$x^2 + y^2 + z^2 = 10^2$$

§ 11.1

\mathbb{R}

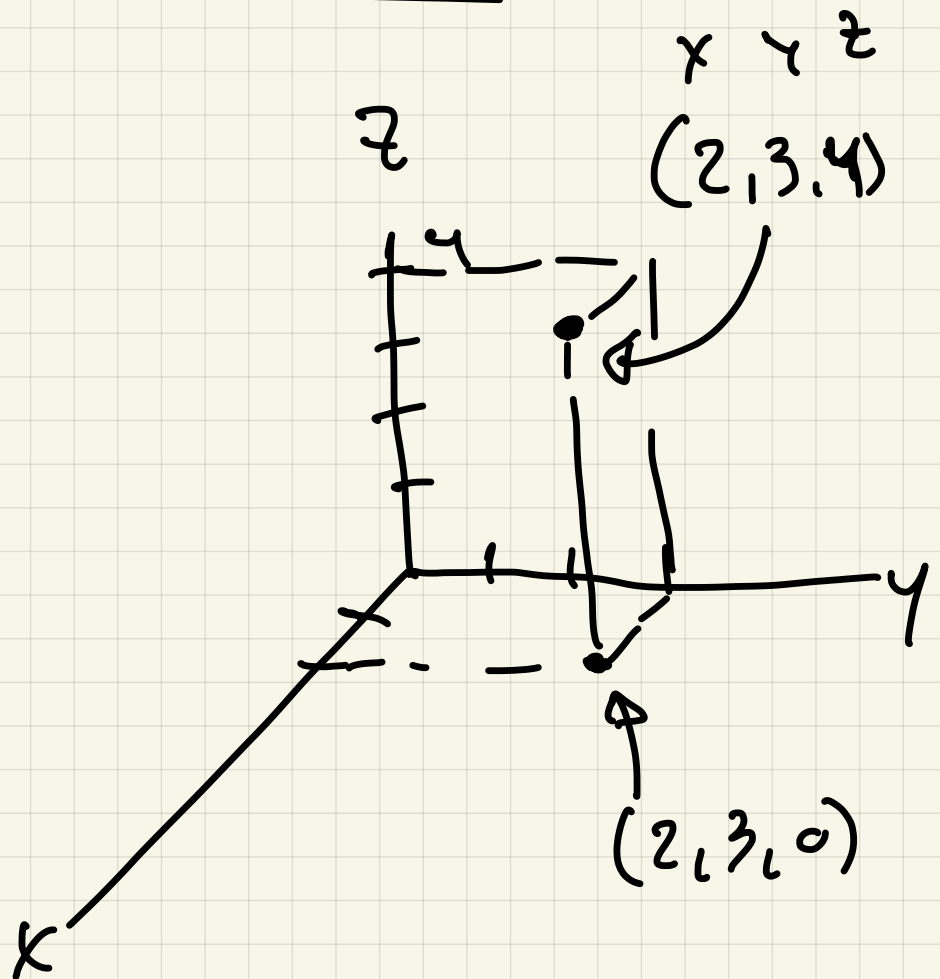




Calc 1 + Calc 2

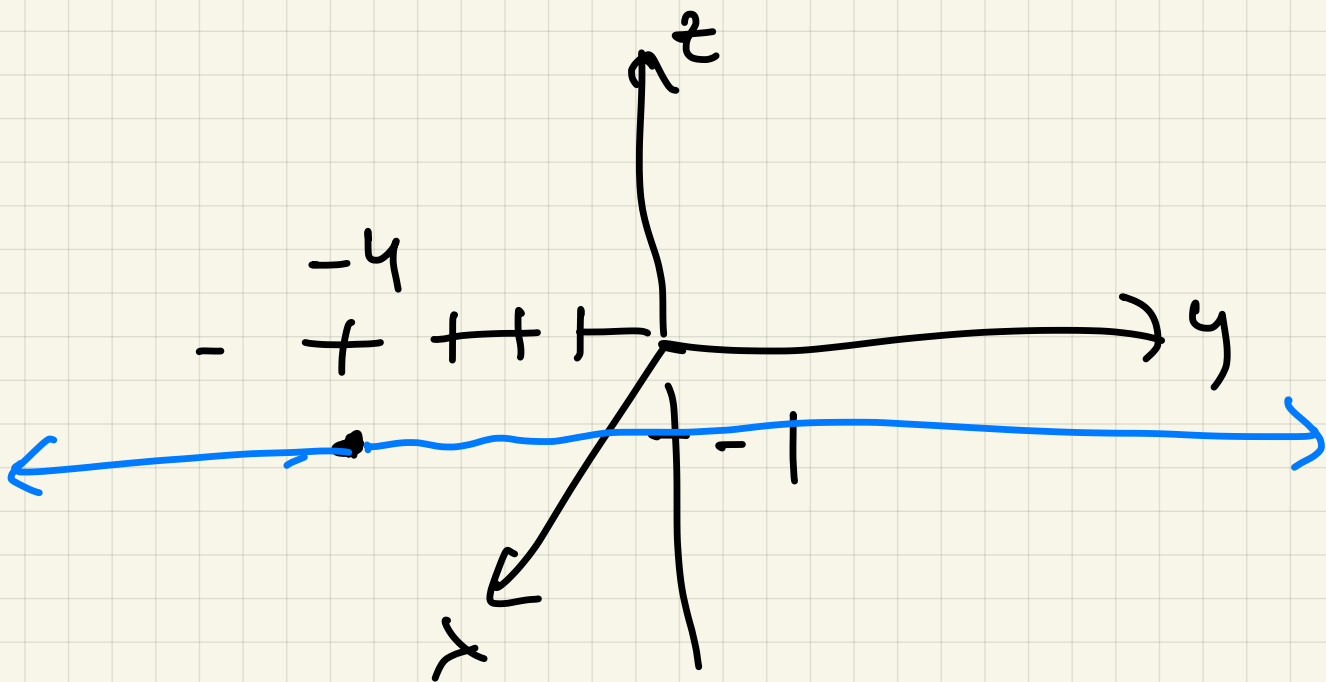
Calc 3

Ex 1 \mathbb{R}^3



Ex 2 Describe / sketch sets

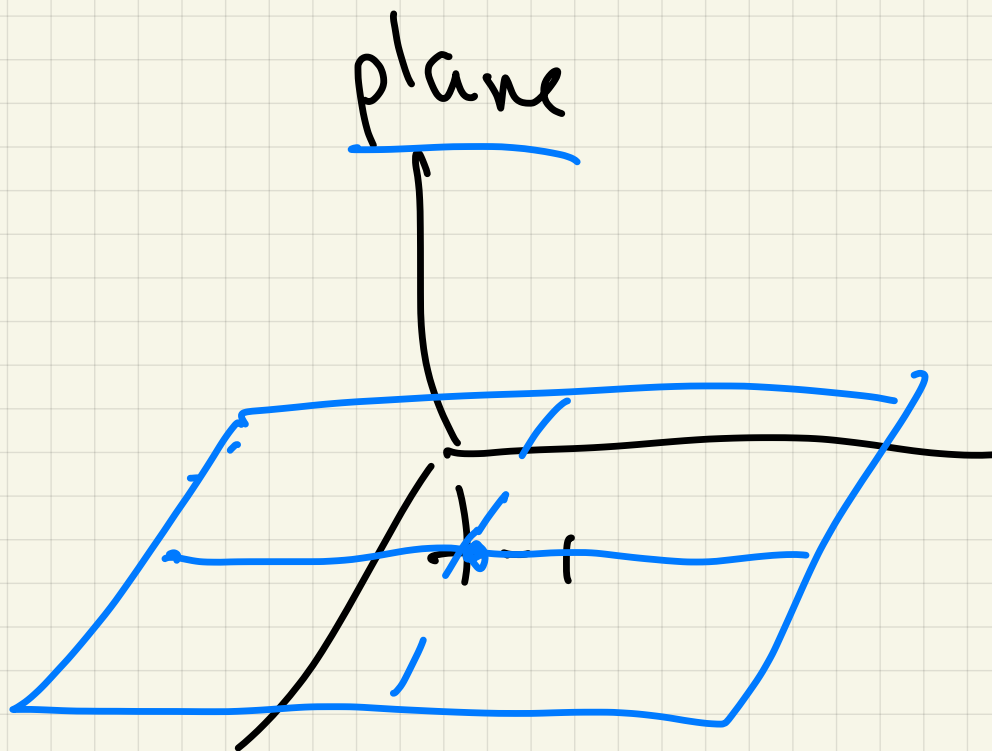
(a) $x=0, y=-4, z=-1$



(b) $x = 0, z = -1$ (y anything)

line

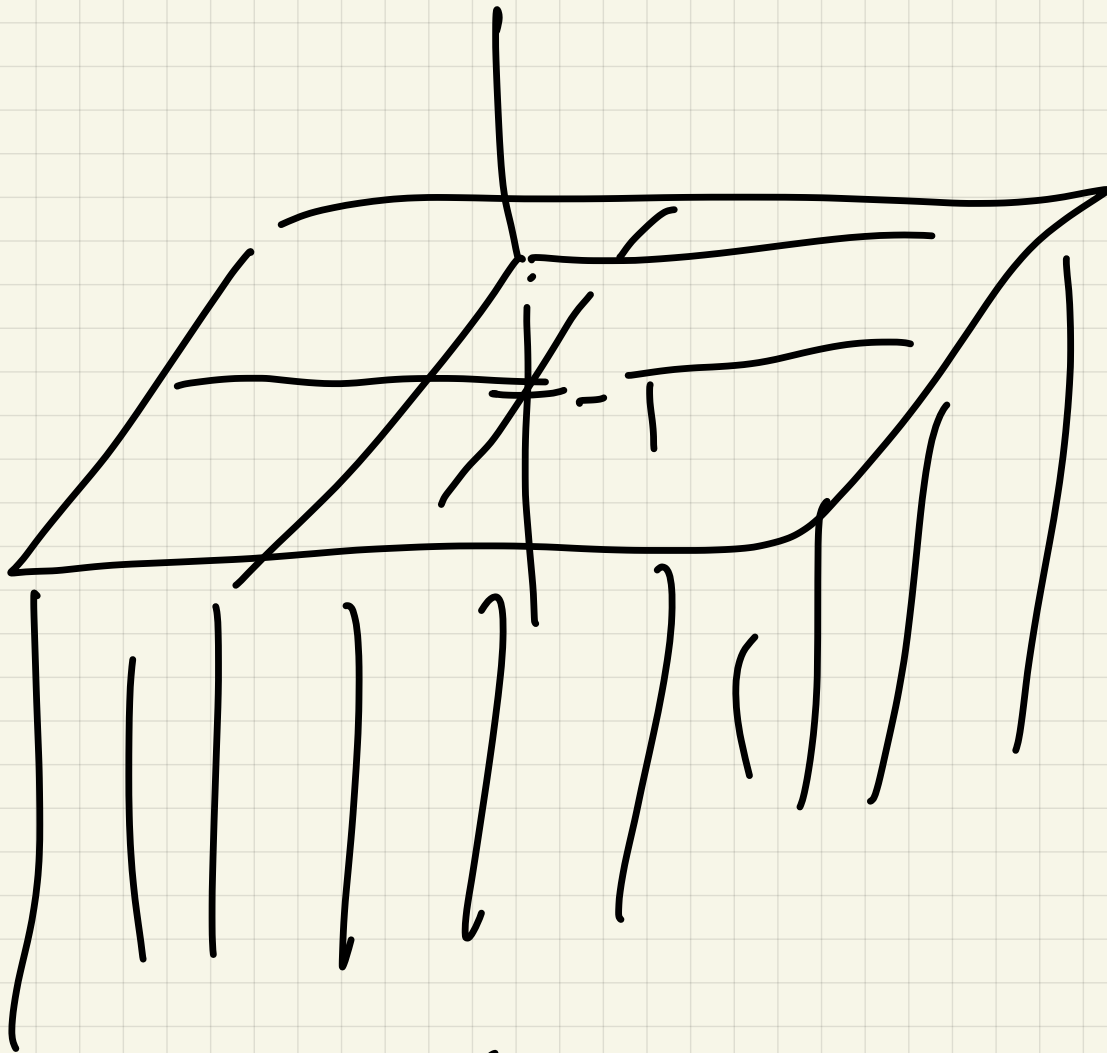
(c) $z = -1$ (x, y anything)



(d)

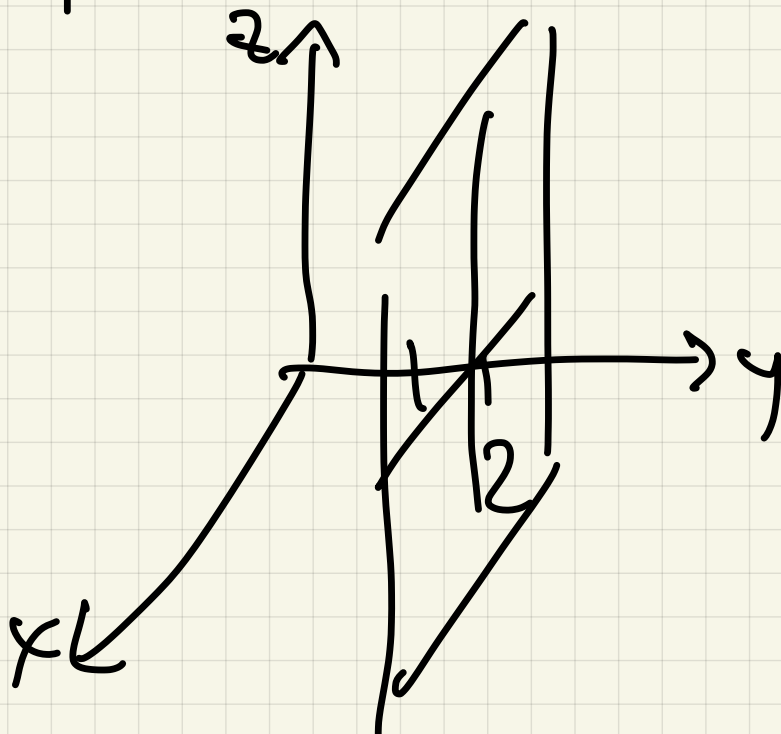
$$z \geq -1$$

Sol. b



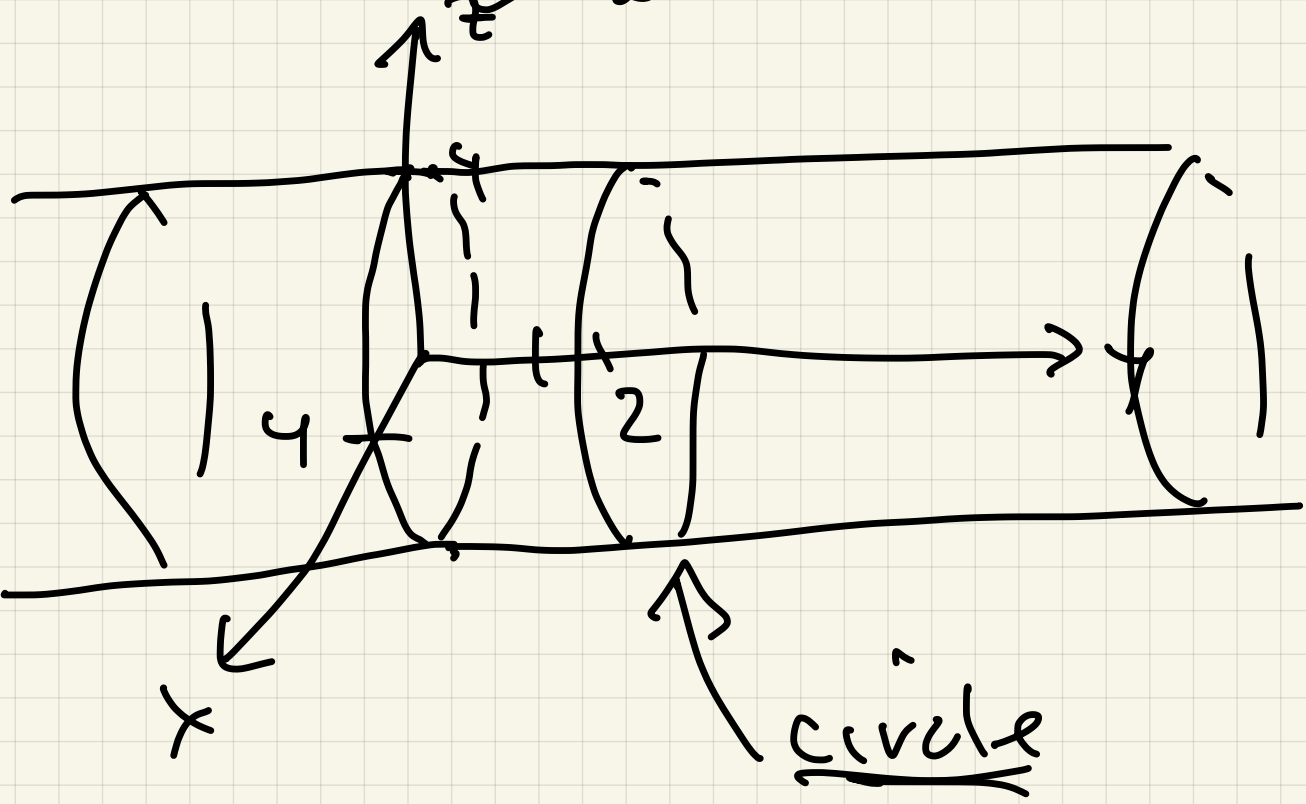
(e)

$$y = 2 \quad (x, z \text{ any})$$



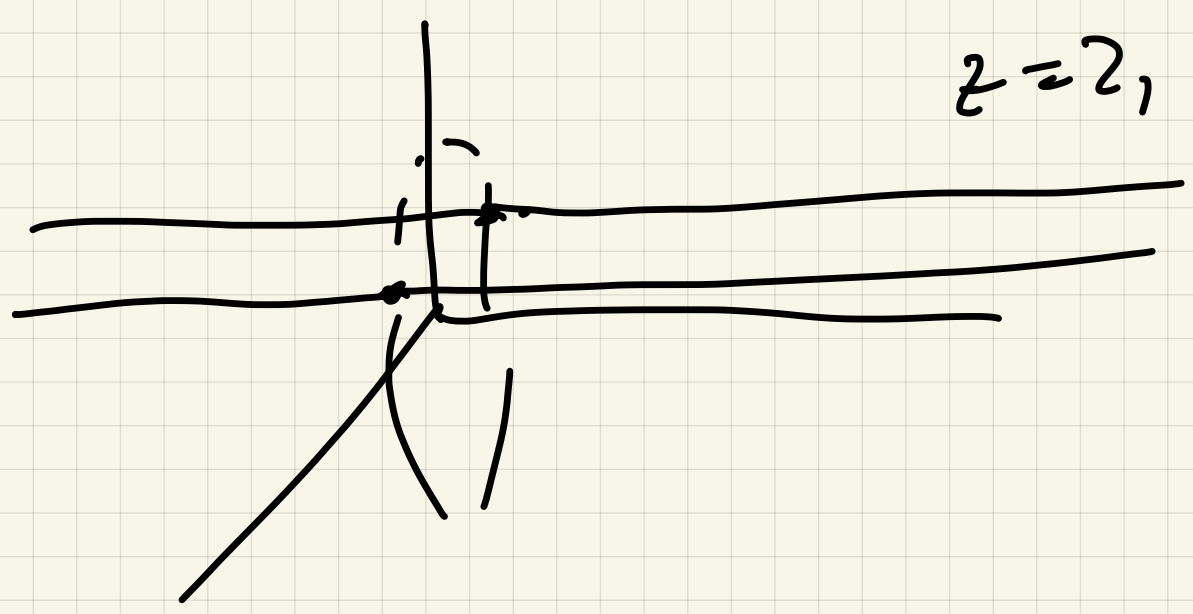
(f) $x^2 + z^2 = 16, z = 2$

$x^2 + z^2 = 16$



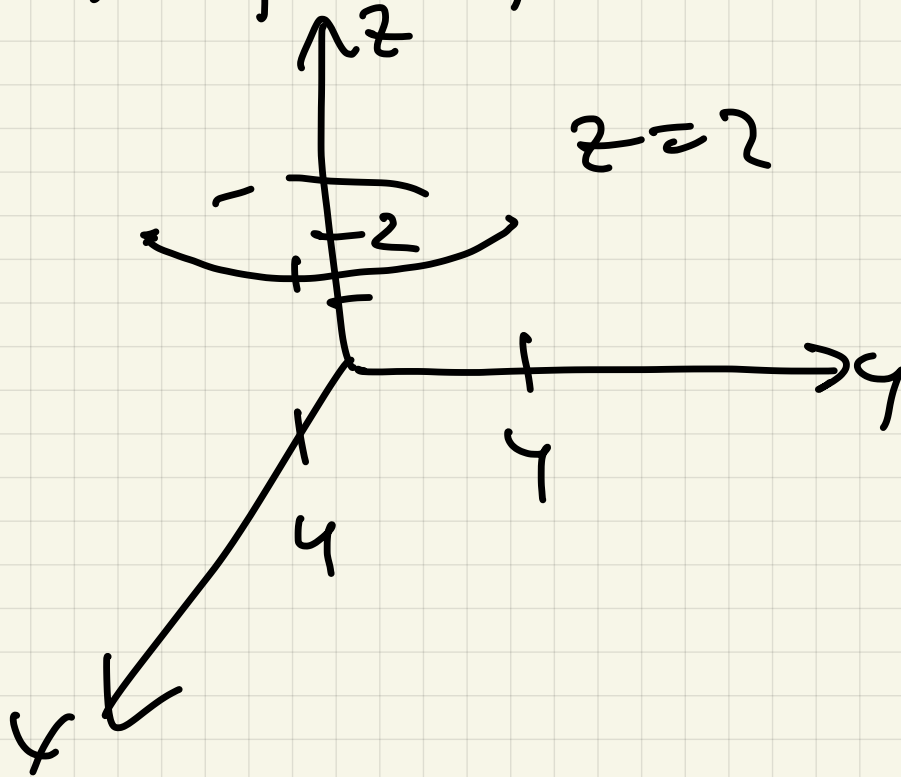
(g) $x^2 + z^2 = 16, z = 2$

$z = 2, x = \pm\sqrt{12}$



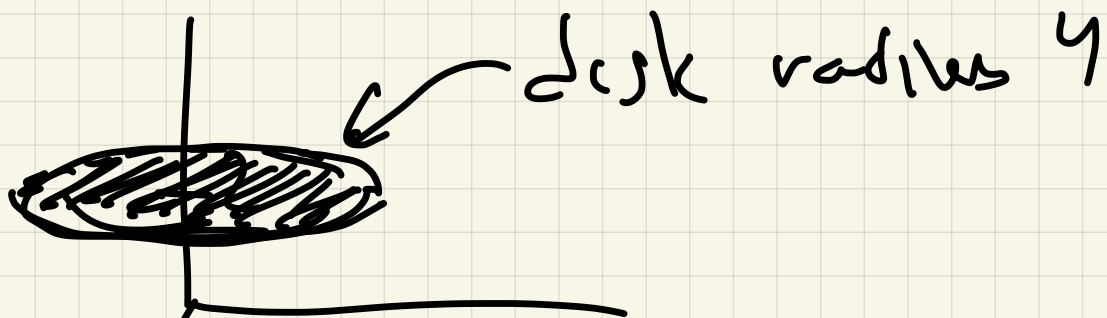
(h)

$$x^2 + y^2 = 16, \quad z = 2$$



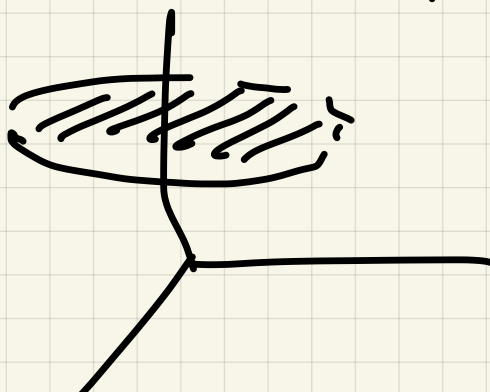
(i)

$$\underline{x^2 + y^2 \leq 16}, \quad z = 2$$

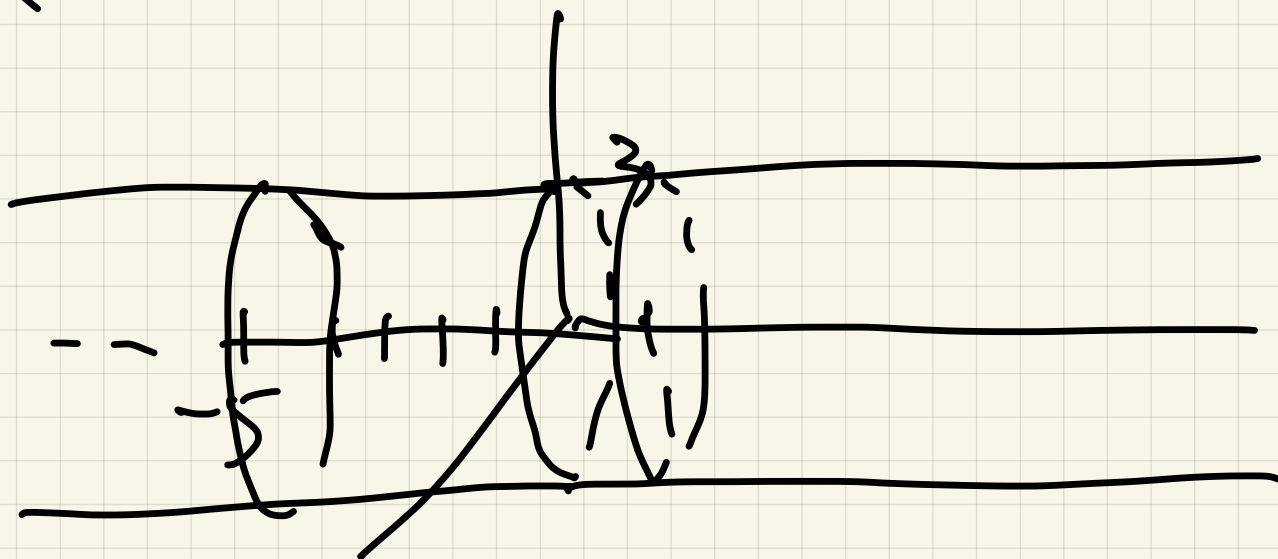


(j)

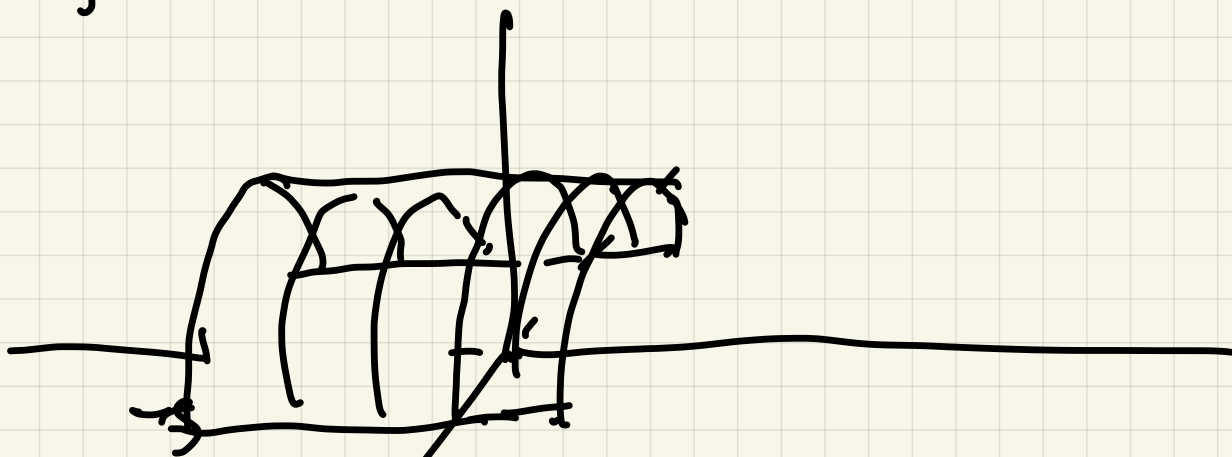
$$x^2 + y^2 < 16, \quad z = 2$$



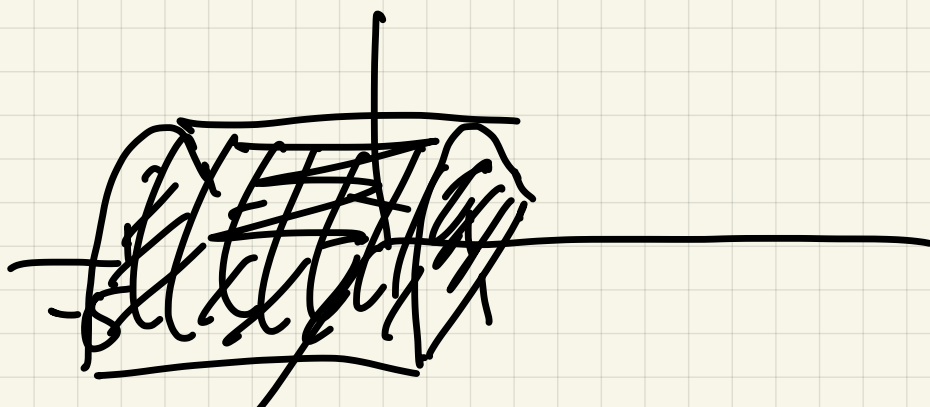
$$(k) \quad x^2 + z^2 = 9, \quad -5 \leq y \leq 1$$



$$(j) \quad x^2 + z^2 = 9, \quad -5 \leq y \leq 1, \quad z \geq 0$$



$$(m) \quad x^2 + z^2 \leq 9, \quad -5 \leq y \leq 1, \quad z \geq 0$$



Distance formula:

The distance from $P_1(x_1, x_2, x_3)$
to $P_2(x_2, y_2, y_3)$ is

$$d = |P_1 P_2| = \sqrt{(x_1 - x_2)^2 + (x_2 - y_2)^2 + (x_3 - y_3)^2}$$

Ex 2 dist from $(0, 1, 3)$ to
 $(3, -5, 0)$ is

$$(a) \sqrt{(0-3)^2 + (-5-1)^2 + (3-0)^2} =$$
$$\sqrt{9 + 36 + 9} =$$
$$\sqrt{54}$$

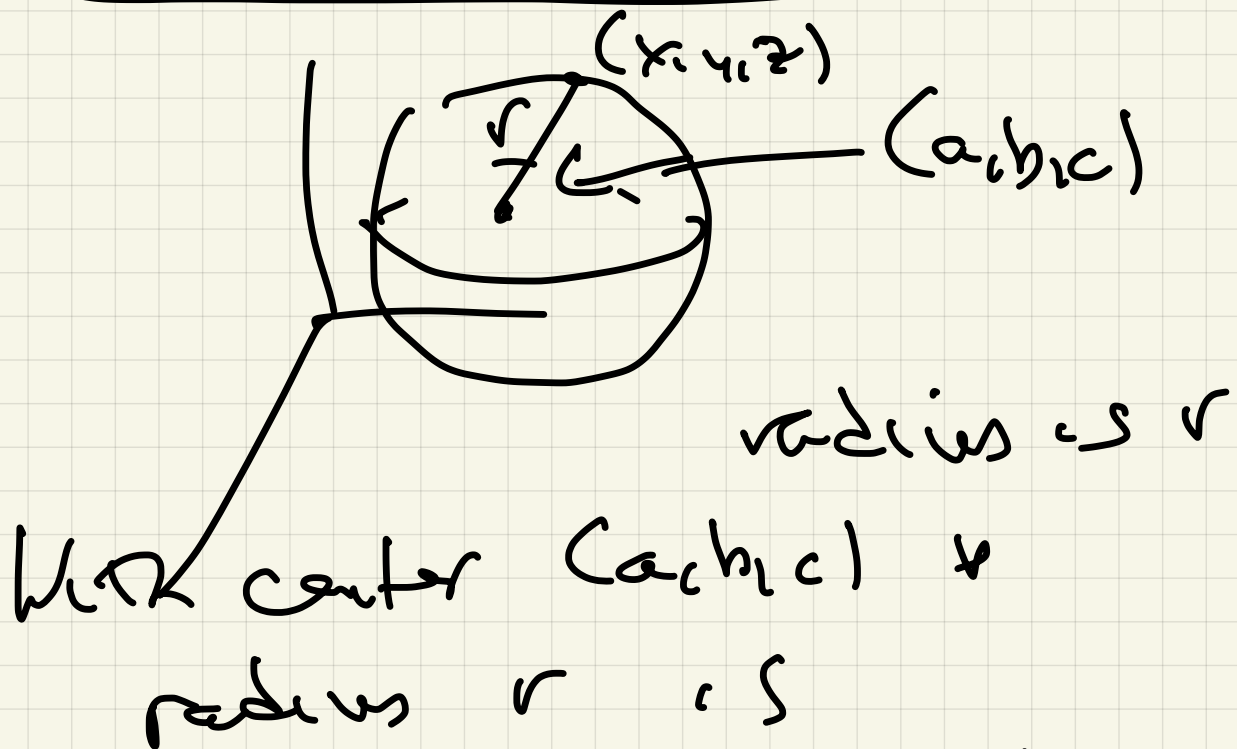
(b) dist from $(0, 1, 3)$ to

x_1 -plane ($z=0$):
is 3



dist from $(0, 1, 3)$ to
 xz plane ($y=0$)

is
Standard equation for sphere:

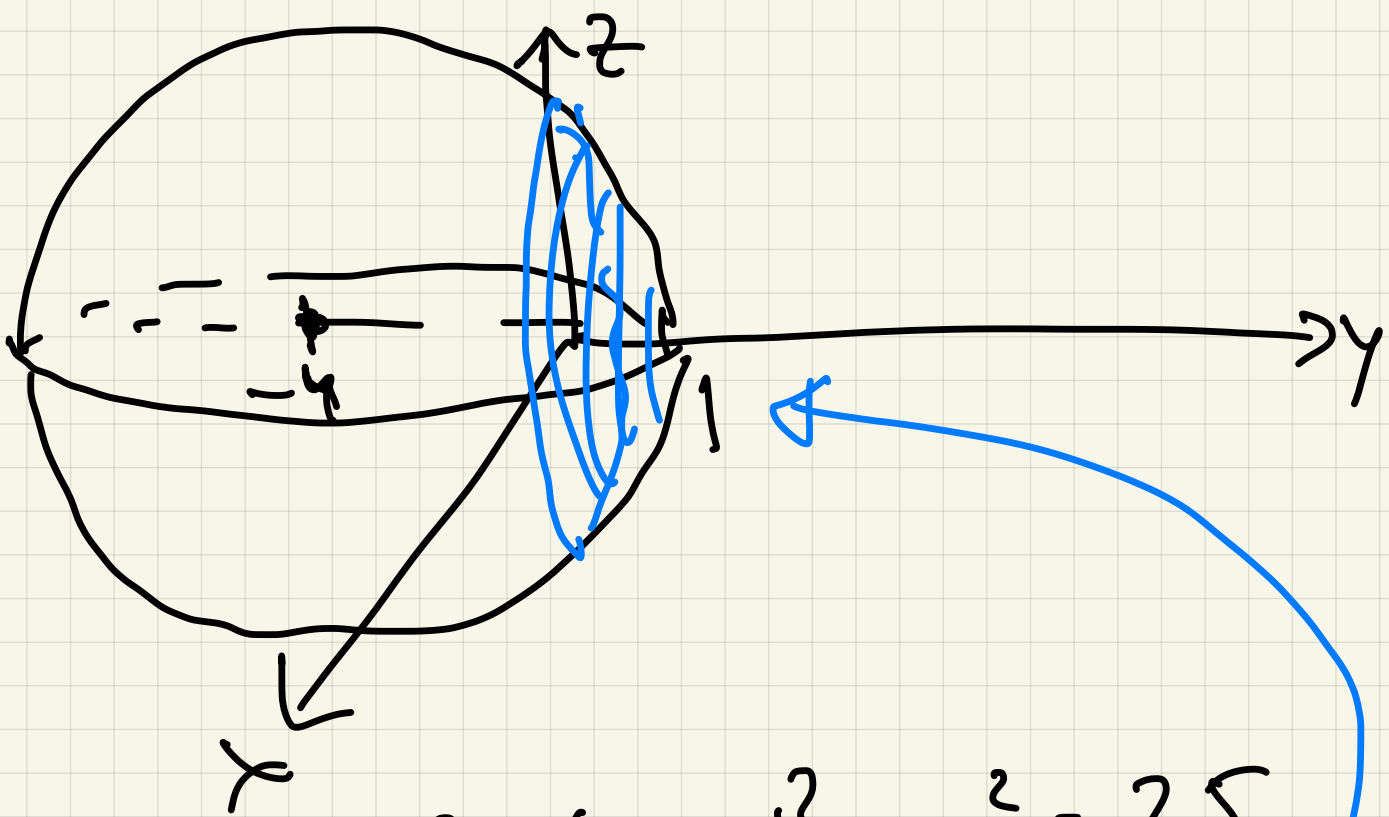


$$(x-a)^2 + (y-b)^2 + (z-c)^2 = r^2$$

Ex 3 sketch

(a) $x^2 + (y+4)^2 + z^2 = 25$

center is $(0, -4, 0)$



(b) $x^2 + (y+4)^2 + z^2 = 25,$
 $y \geq 0$

Ex 4 Find center/radius of
 Sphere

$$\underline{x^2 + 10x + y^2 - 6y + z^2 - 7z = 60}$$

Idea complete square

$$x^2 + 10x + \underline{25} + (y^2 - 6y + \underline{9}) + (z^2 - 7z + \underline{\frac{49}{4}})$$

$$(x+5)^2 + (y-3)^2 + (z-\frac{7}{2})^2$$

$$60 + 25 + 9 + \frac{49}{4}$$

$$\frac{240 + 100 + 36 + 49}{4}$$

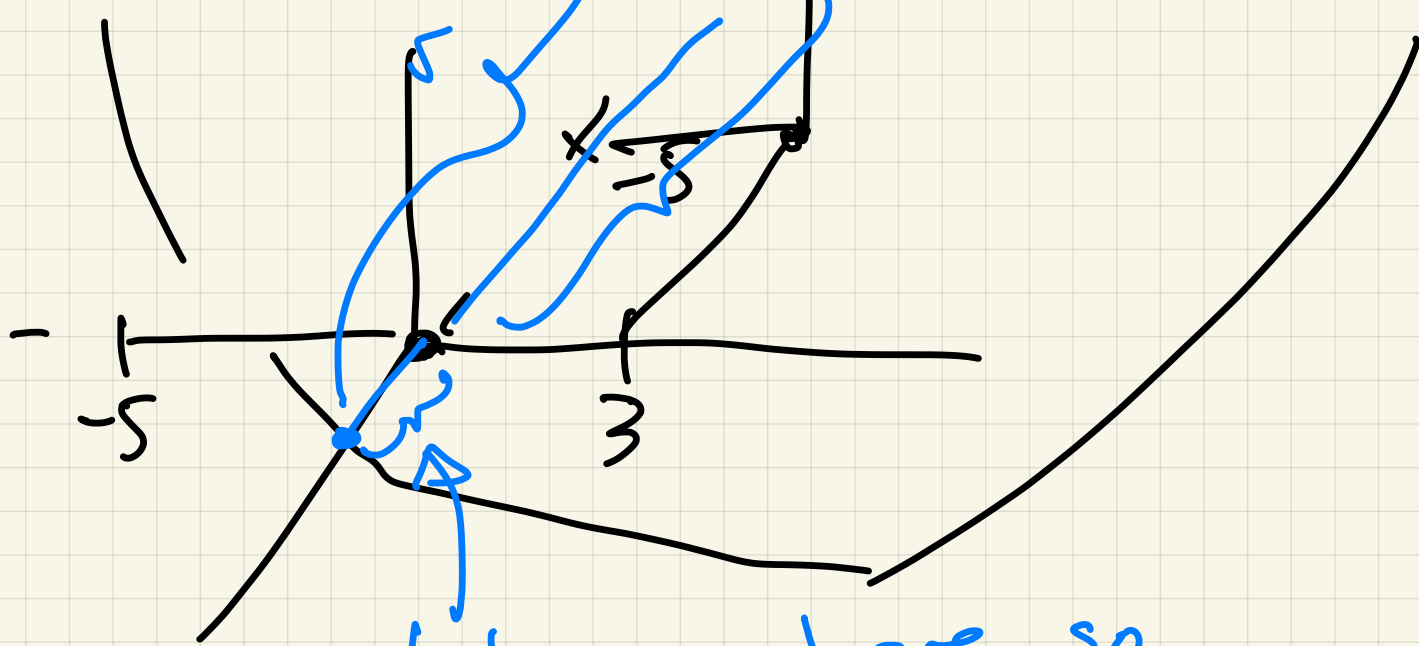
$$\frac{425}{4} = r^2$$

$$r = \frac{\sqrt{425}}{2} = \frac{5\sqrt{17}}{2}$$

Center is $(-5, 3, \frac{7}{2})$

(6) What is distance from sphere to origin?

$(-5, 3, \frac{7}{2})$
Center



distance is here, so
 $\text{dist} = \text{radius of sphere} - \text{dist from center to } (x, y, z)$

$$= \frac{5\sqrt{17}}{2} - \sqrt{(-5-0)^2 + (3-0)^2 + \left(\frac{7}{2}-0\right)^2}$$

$$= \frac{5\sqrt{17}}{2} - \sqrt{25 + 9 + \frac{49}{4}}$$

$$34 + \frac{49}{4} = \frac{136 + 49}{4} = \frac{185}{4}$$

$$= \frac{5\sqrt{17}}{2} - \frac{\sqrt{185}}{2} = \frac{5\sqrt{17} - \sqrt{185}}{2}$$