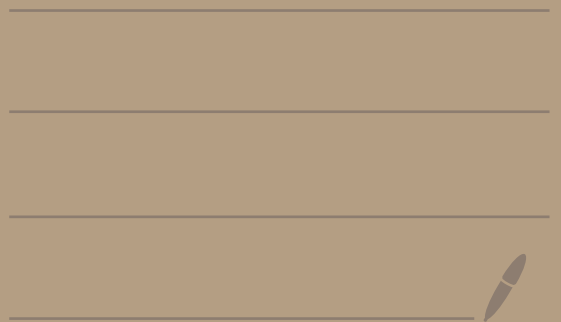
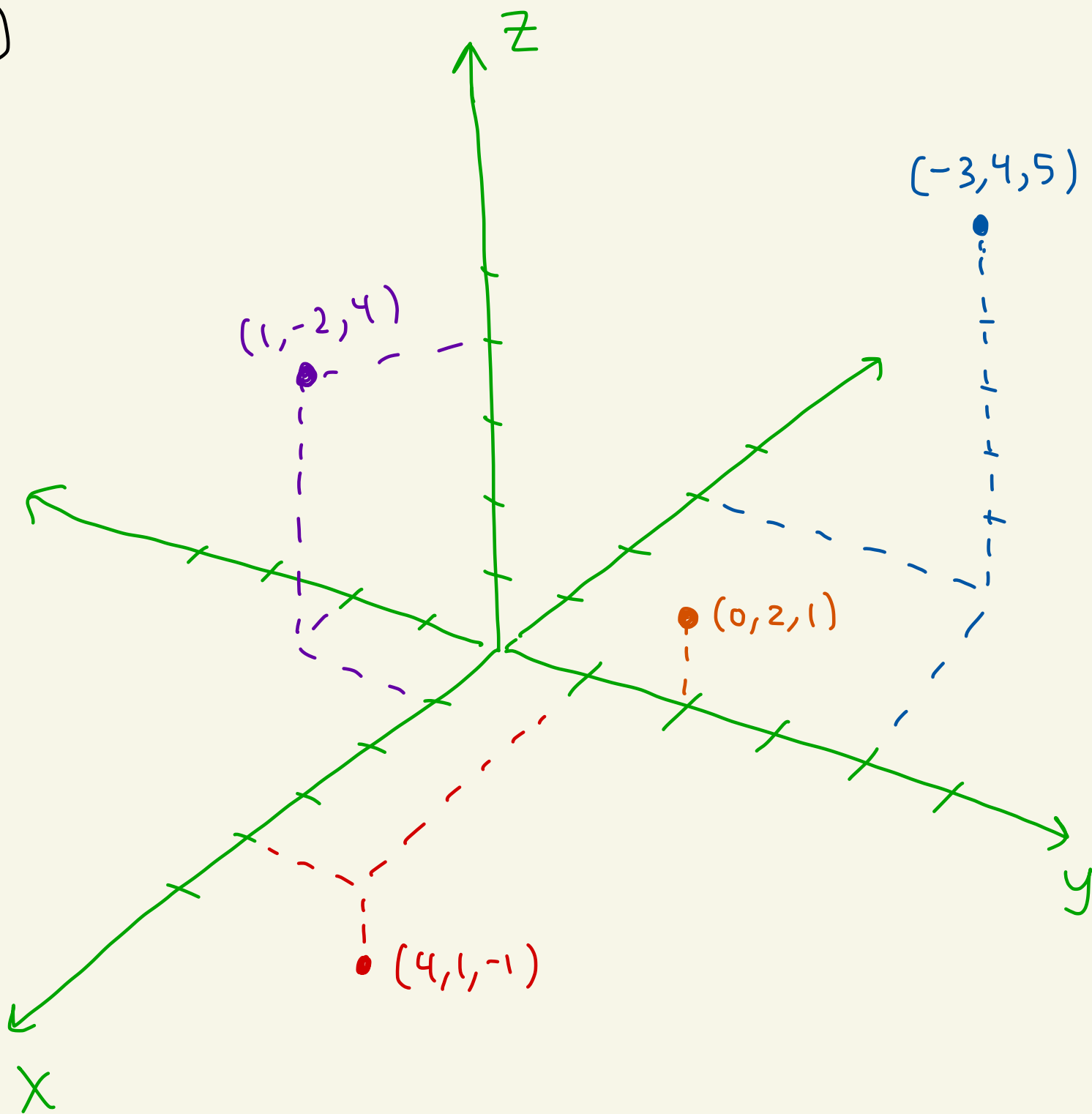


Math 2130

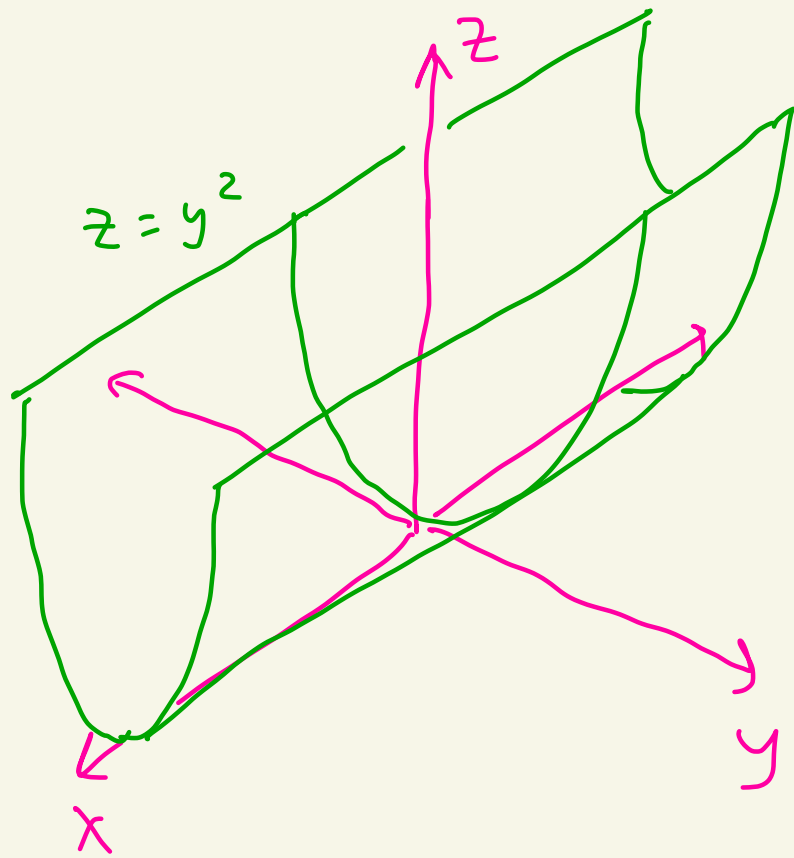
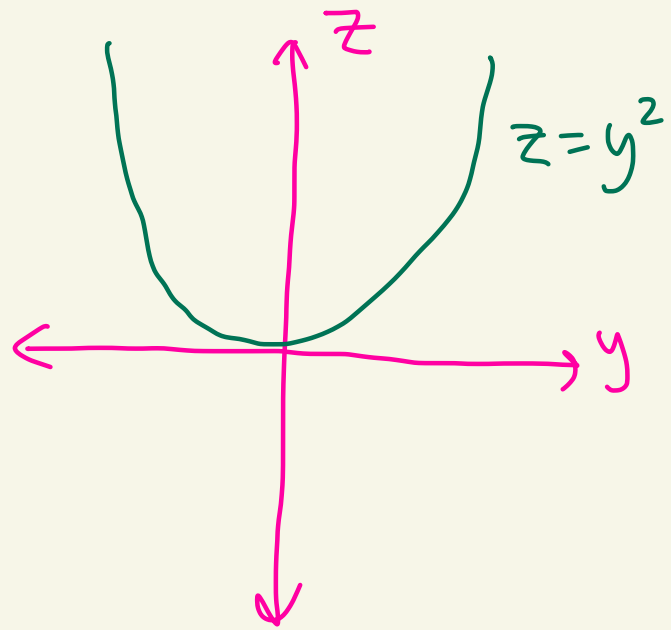
HW 1 - Solutions



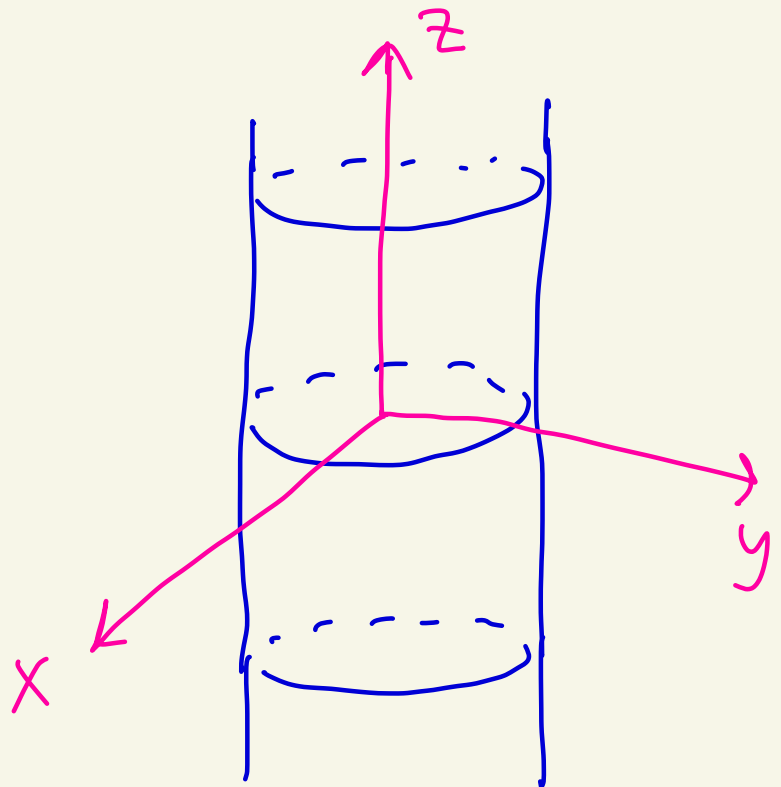
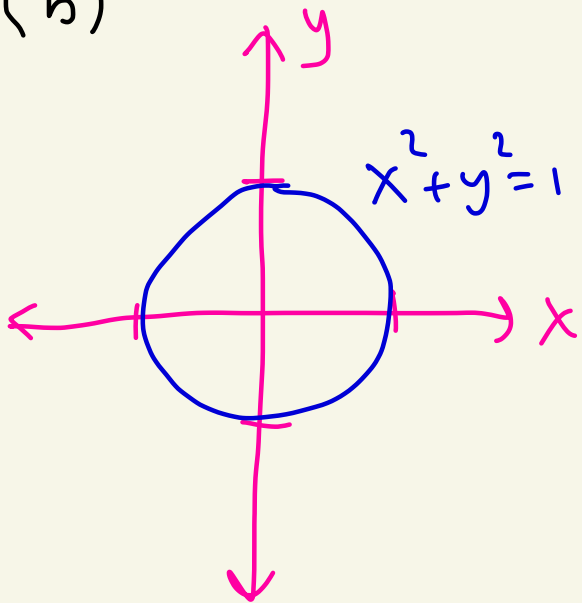
①



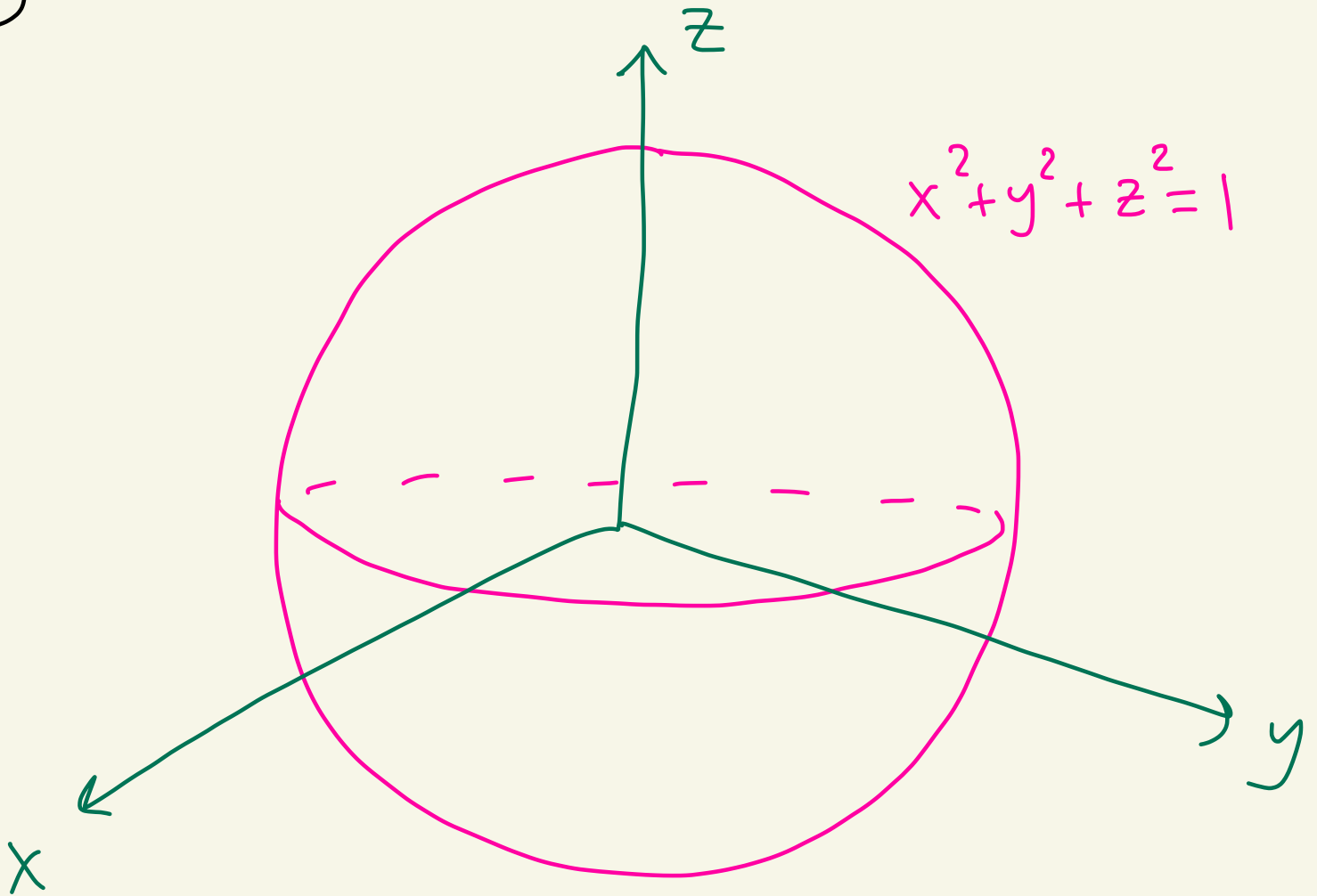
② (a)



(b)



3



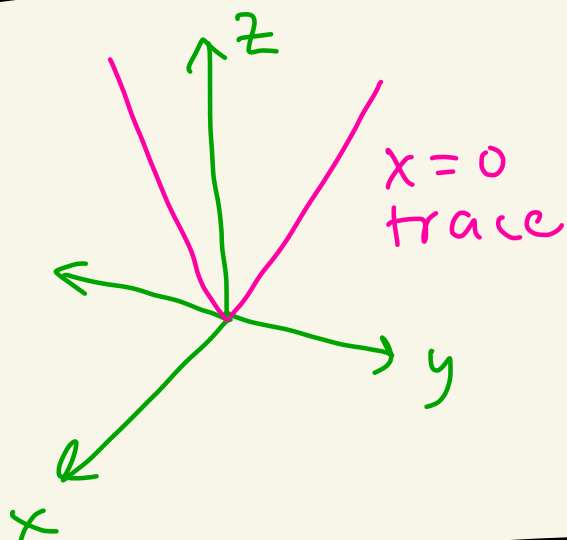
sphere of radius 1
centered at origin

$$(4) \quad z = \sqrt{x^2 + y^2}$$

(a) $x=0$ trace

$$z = \sqrt{y^2}$$

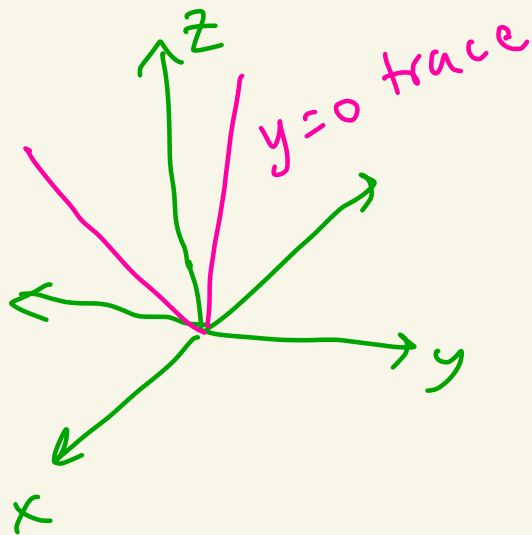
$$z = |y|$$



(b) $y=0$ trace

$$z = \sqrt{x^2}$$

$$z = |x|$$

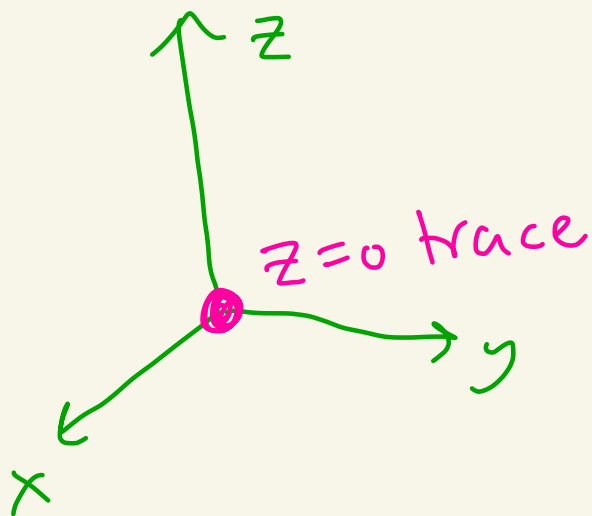


(c) $z=0$ trace

$$0 = \sqrt{x^2 + y^2}$$

$$0 = x^2 + y^2$$

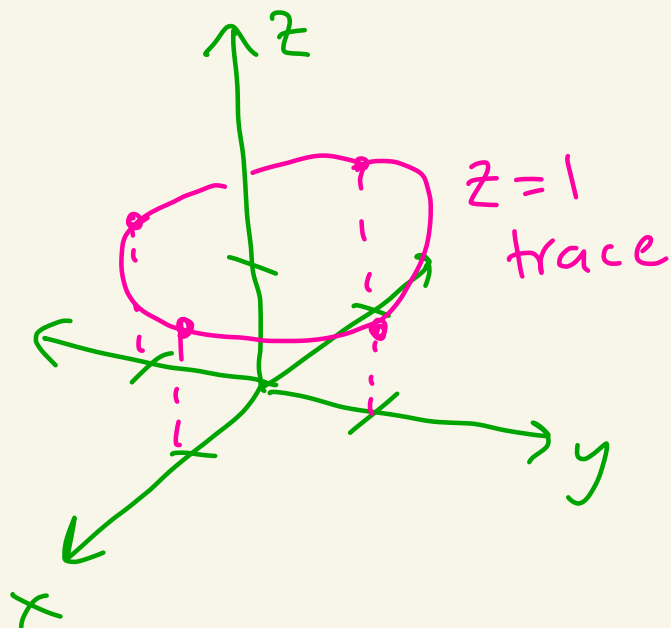
$$(x, y) = (0, 0)$$



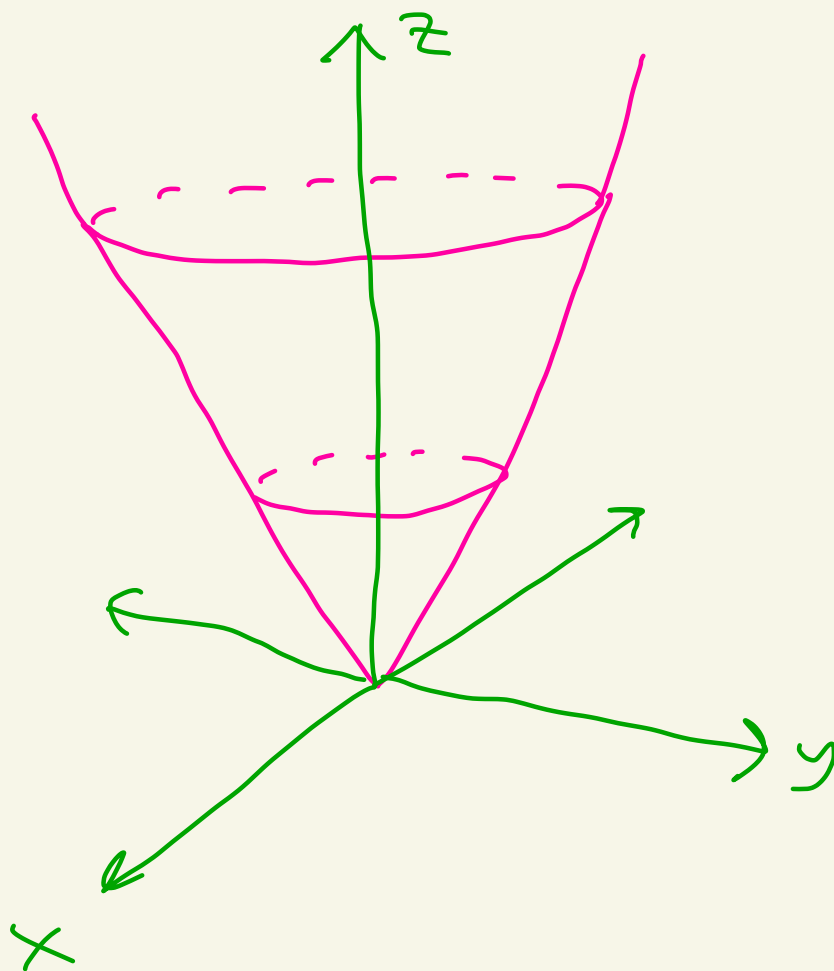
(d) $z=1$ trace

$$1 = \sqrt{x^2 + y^2}$$

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



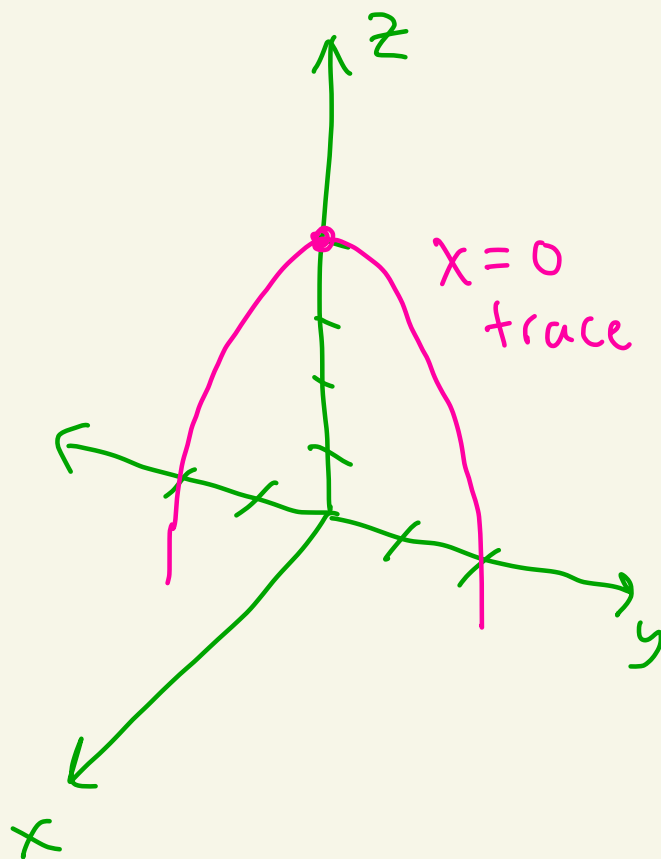
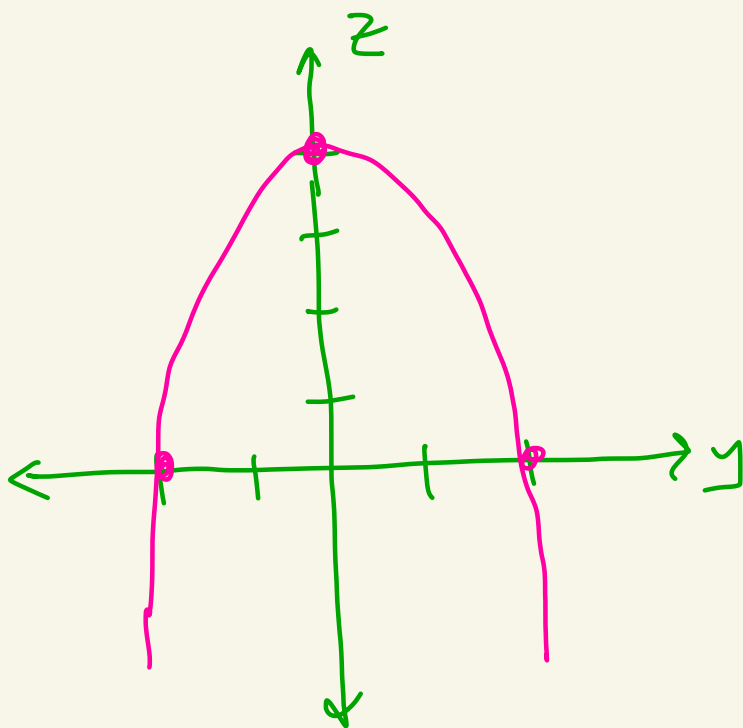
(e) $z = \sqrt{x^2 + y^2}$



⑤ $z = 4 - x^2 - y^2$

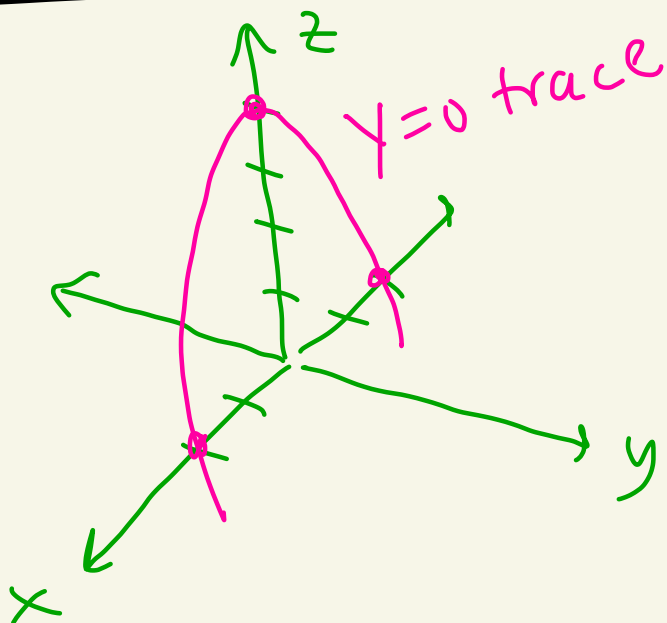
(a) $x = 0$ trace

$$z = 4 - y^2$$



(b) $y = 0$ trace

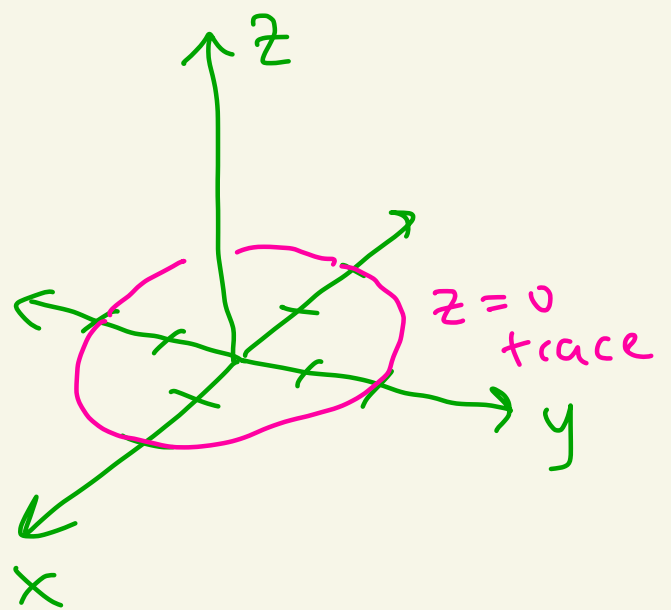
$$z = 4 - x^2$$



(c) $z=0$ trace

$$4 - x^2 - y^2 = 0$$

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

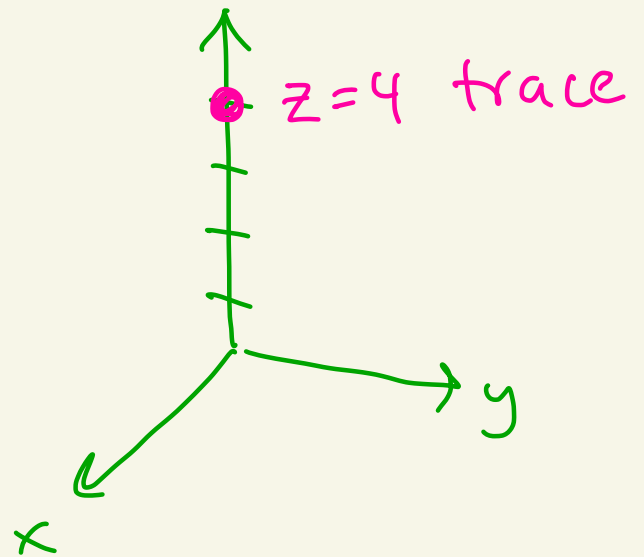


(d) $z=4$ trace

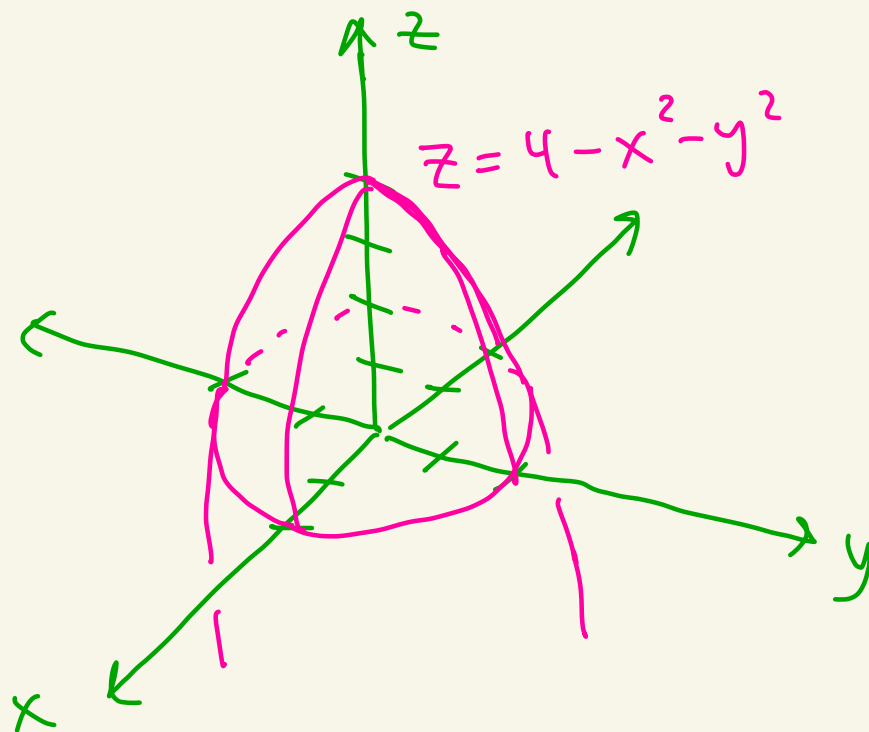
$$4 - x^2 - y^2 = 4$$

$$0 = x^2 + y^2$$

$$(x, y) = (0, 0)$$



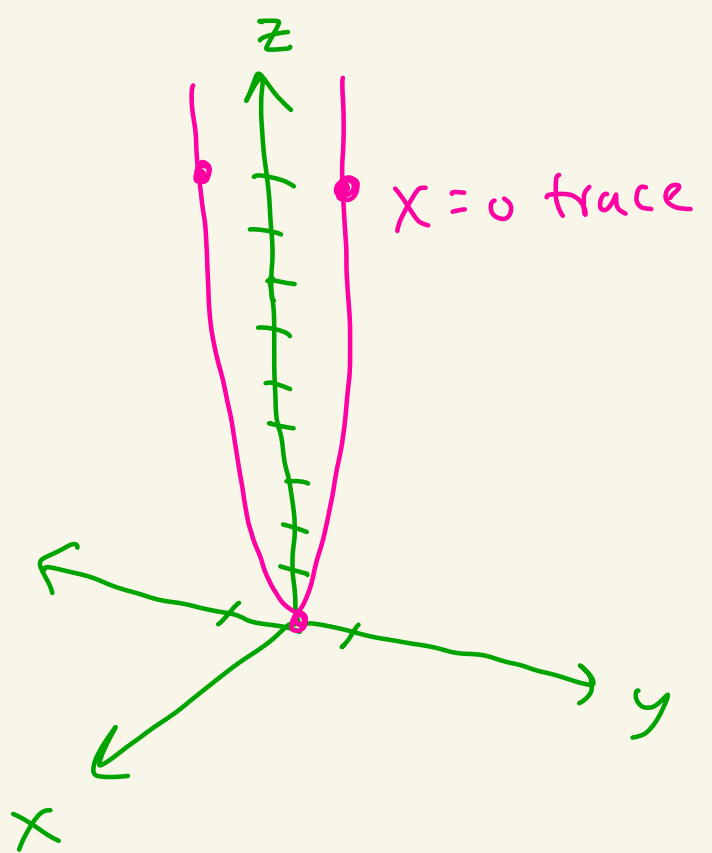
(e)



$$(6) \quad z = x^2 + 9y^2$$

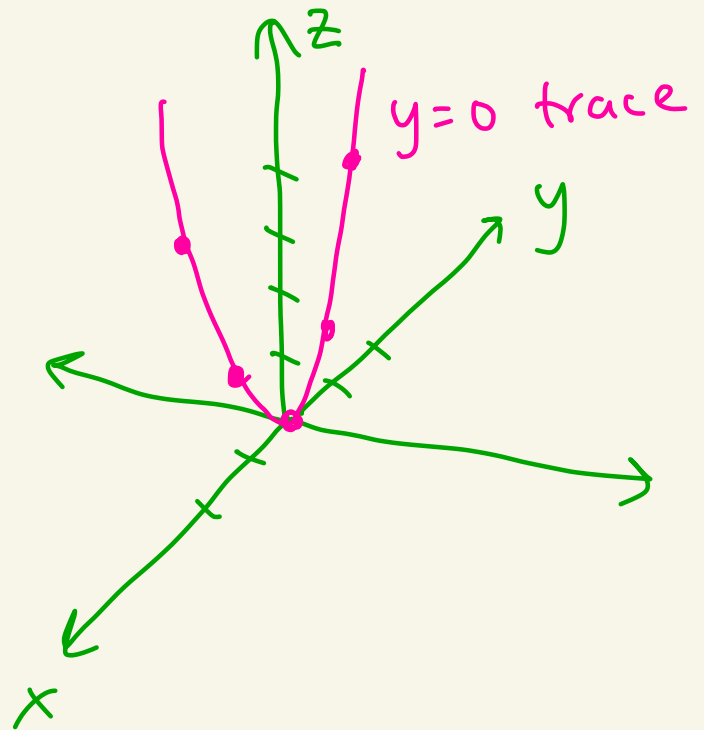
(a) $x=0$ trace:

$$z = 9y^2$$



(b) $y=0$ trace:

$$z = x^2$$

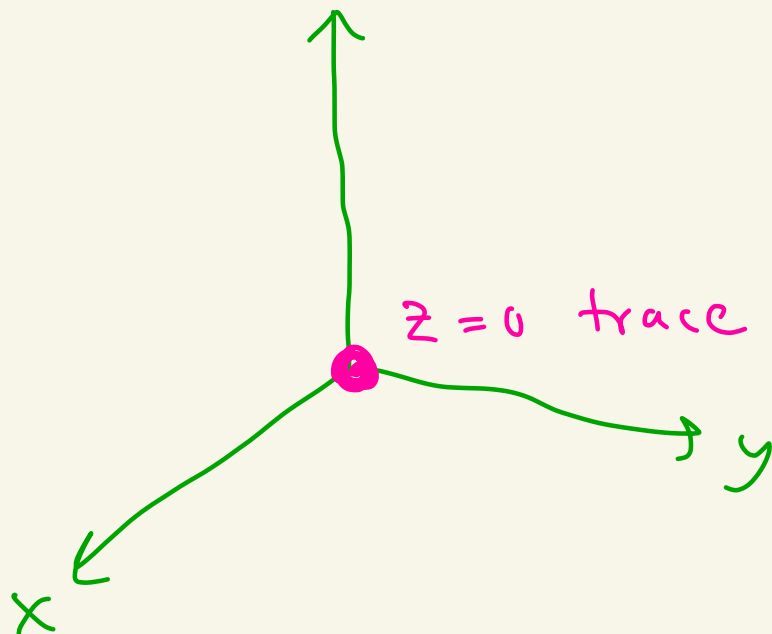


(c) $z=0$ trace

$$x^2 + 9y^2 = 0$$

only one
point

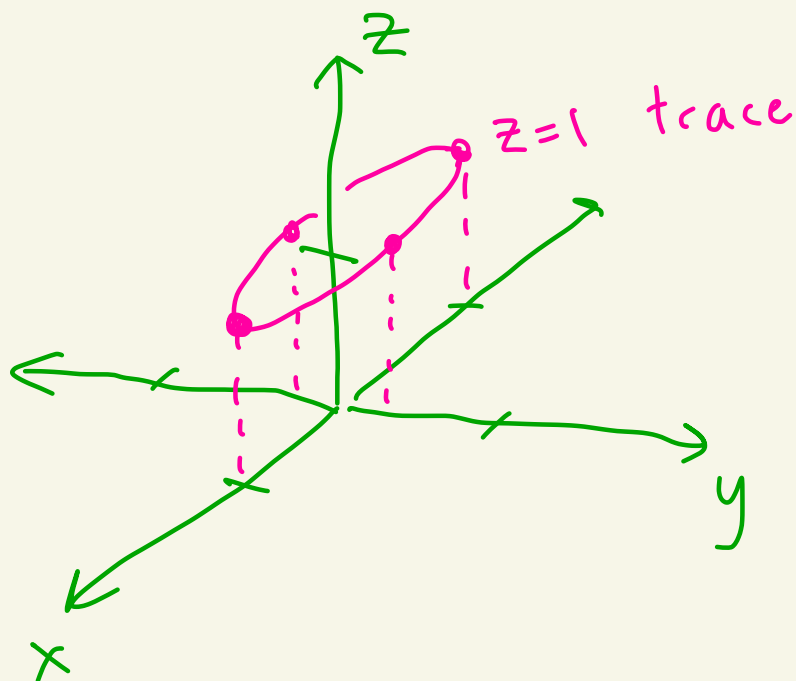
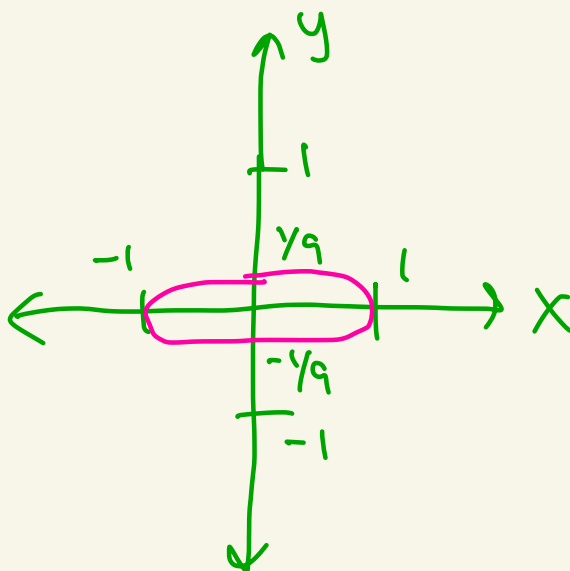
$$(x, y) = (0, 0)$$



(d) $z=1$ trace

$$x^2 + 9y^2 = 1$$

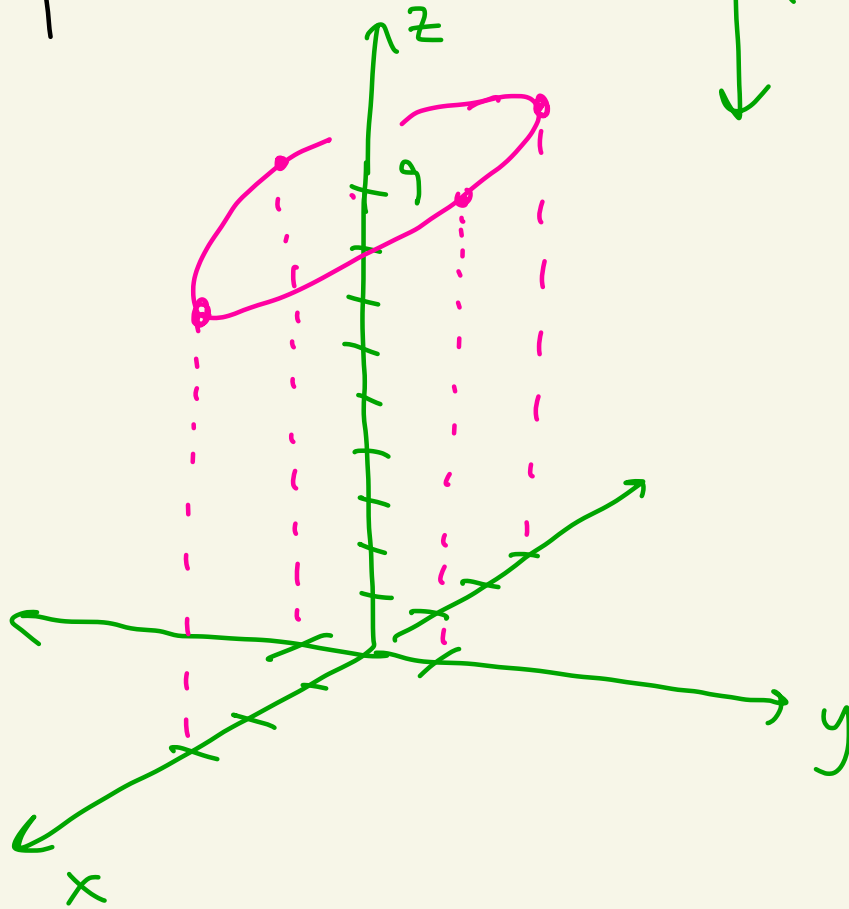
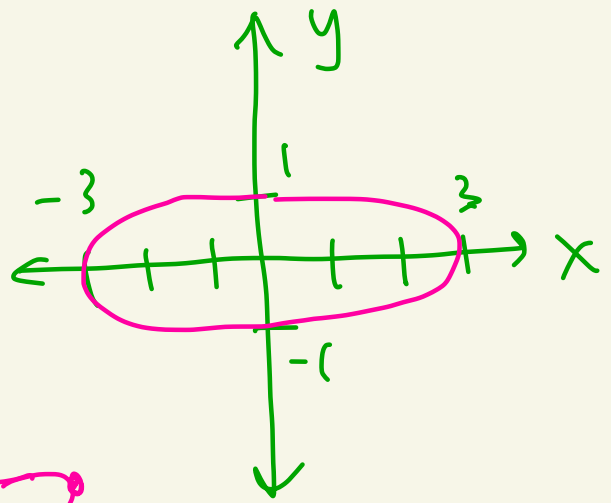
$$\frac{x^2}{1^2} + \frac{y^2}{(\frac{1}{9})^2} = 1$$



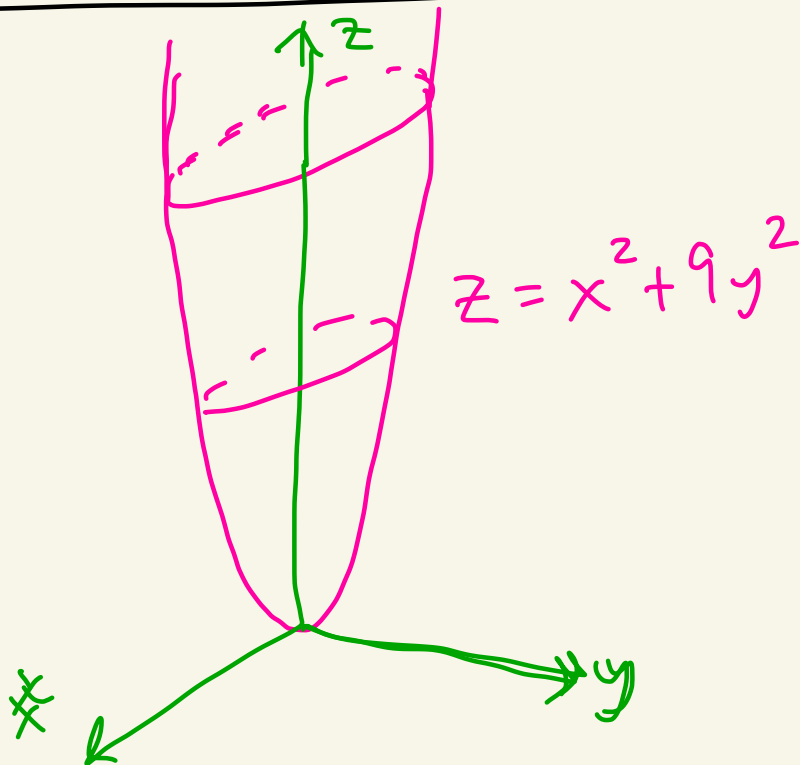
(e) $z=9$ trace

$$x^2 + 9y^2 = 9$$

$$\frac{x^2}{3^2} + \frac{y^2}{1^2} = 1$$



(f)



⑦ $f(x,y) = x^2 + 2y^2$

$k=0$: $0 = x^2 + 2y^2$

$k=2$: $2 = x^2 + 2y^2$

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

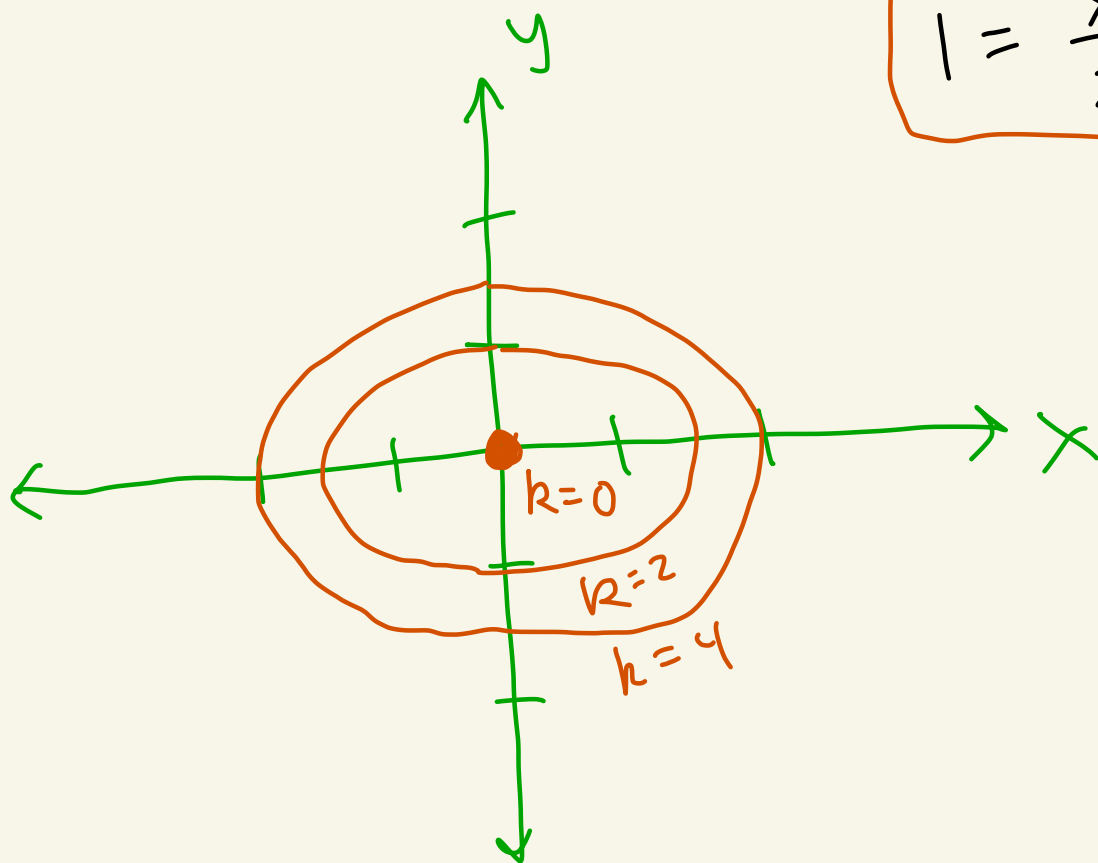
$\sqrt{2} \approx 1.414$

$1 = \frac{x^2}{(\sqrt{2})^2} + \frac{y^2}{1^2}$

$k=4$: $4 = x^2 + 2y^2$

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

$1 = \frac{x^2}{2^2} + \frac{y^2}{(\sqrt{2})^2}$



⑧ $f(x, y) = y$

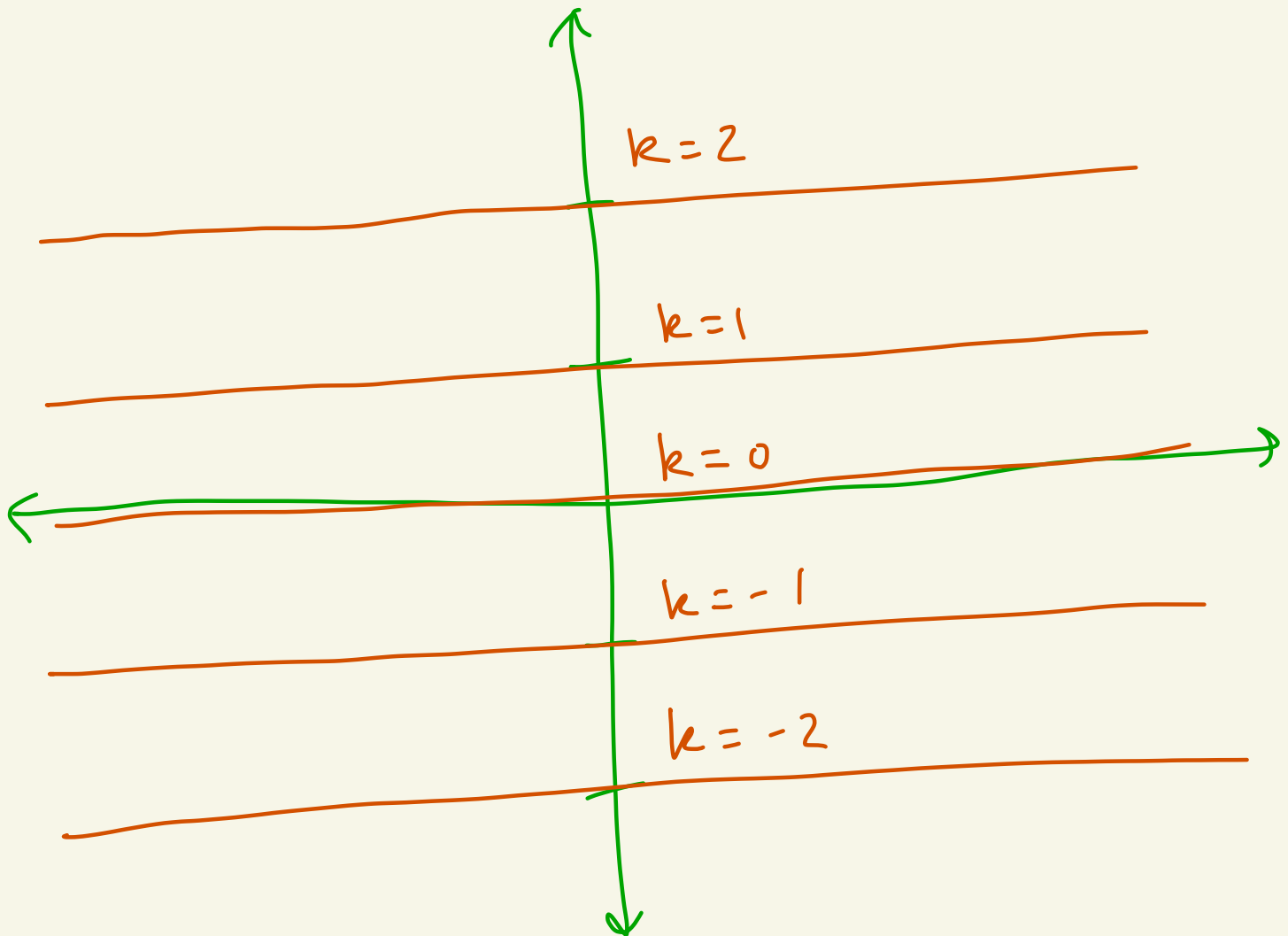
$k = -2$: $-2 = y$

$k = -1$: $-1 = y$

$k = 0$: $0 = y$

$k = 1$: $1 = y$

$k = 2$: $2 = y$



⑨ $z = 6 - x - 2y$

$k = 6$: $6 = 6 - x - 2y \rightarrow x + 2y = 0$

↓

$y = -\frac{1}{2}x$

$k = 3$: $3 = 6 - x - 2y \rightarrow x + 2y = 3$

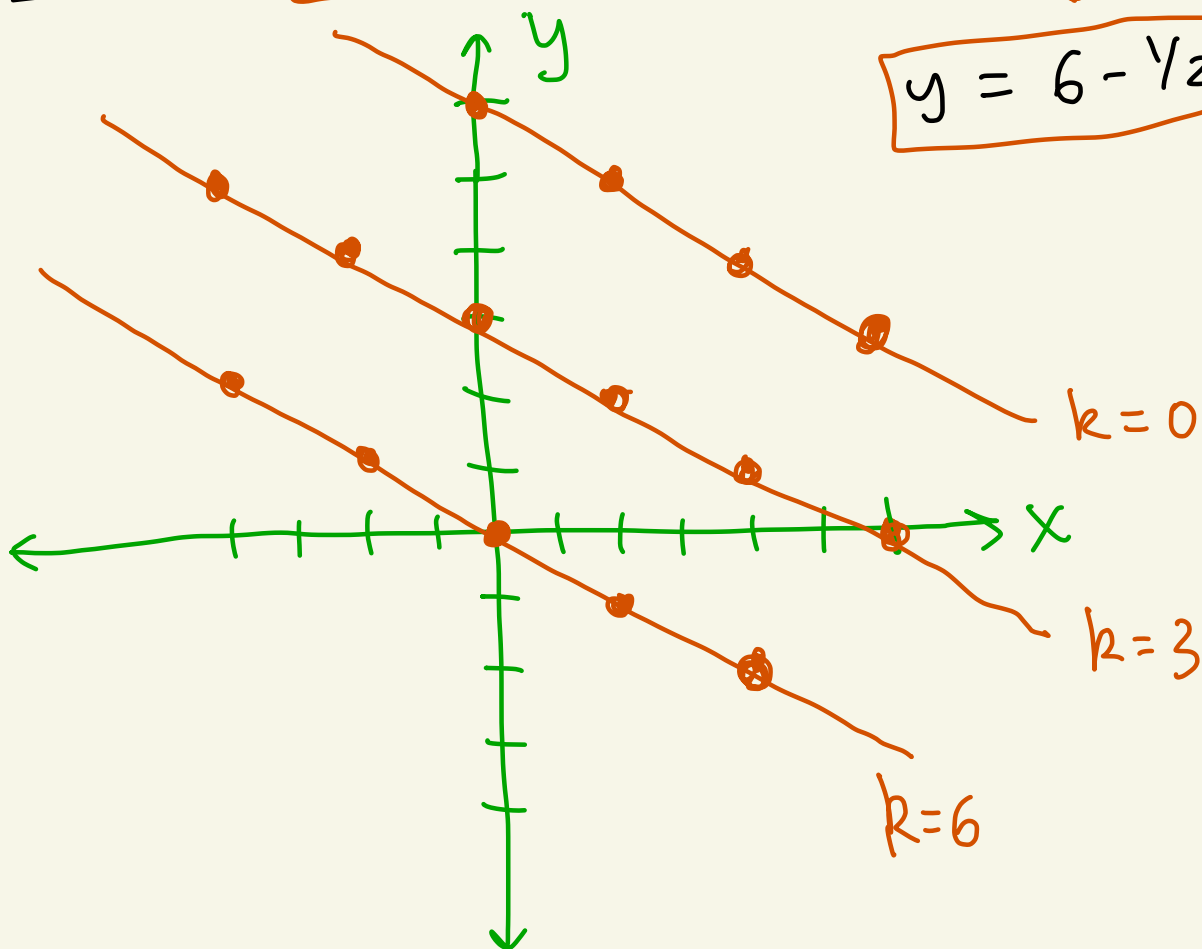
↓

$y = 3 - \frac{1}{2}x$

$k = 0$: $0 = 6 - x - 2y \rightarrow x + 2y = 6$

↓

$y = 6 - \frac{1}{2}x$



⑩ $z = 3 - x^2 - y^2$

$k = 3$: $3 - x^2 - y^2 = 3 \rightarrow x^2 + y^2 = 0$

$k = 2$: $3 - x^2 - y^2 = 2 \rightarrow x^2 + y^2 = 1$

$k = 0$: $3 - x^2 - y^2 = 0 \rightarrow x^2 + y^2 = (\sqrt{3})^2$

$\sqrt{3} \approx 1.73$

$k = -1$: $3 - x^2 - y^2 = -1 \rightarrow x^2 + y^2 = 4$

