

Math 16C

Kouba

3D - Graphing Using Intercepts, Traces, and Level Curves

Ex: Sketch the graph of
 $z = x^2 + y^2 - 9$ in 3D-Space.

I.) Find Intercepts:

1.) Let $x=0, y=0$: z-intercept is $z=-9$.

2.) Let $x=0, z=0$: $0 = y^2 - 9 \rightarrow y^2 = 9 \rightarrow$

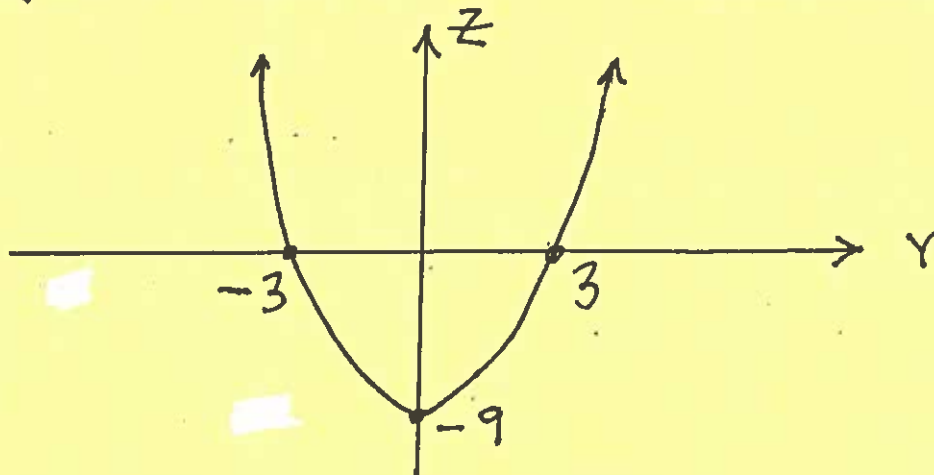
y-intercepts are $y = \pm 3$.

3.) Let $y=0, z=0$: $0 = x^2 - 9 \rightarrow x^2 = 9 \rightarrow$

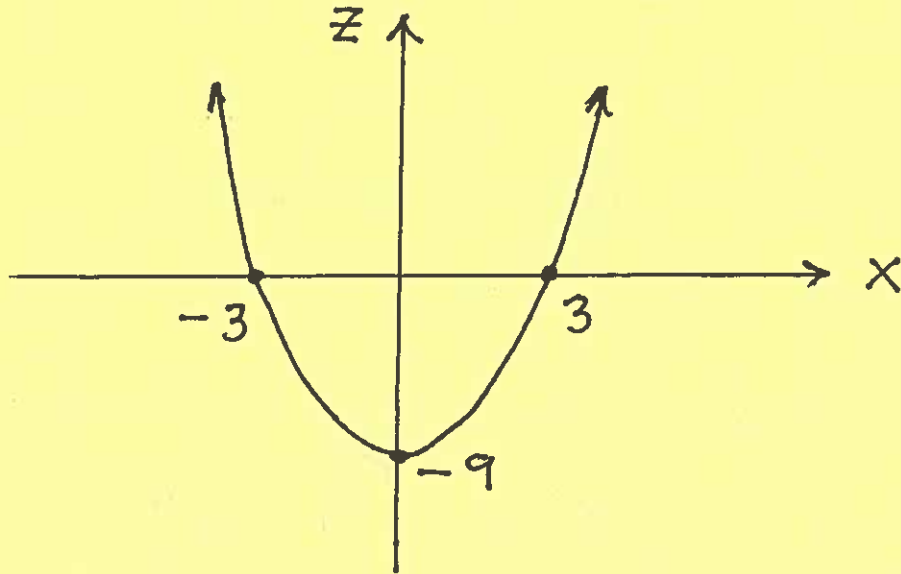
x-intercepts are $x = \pm 3$.

II.) Find Traces:

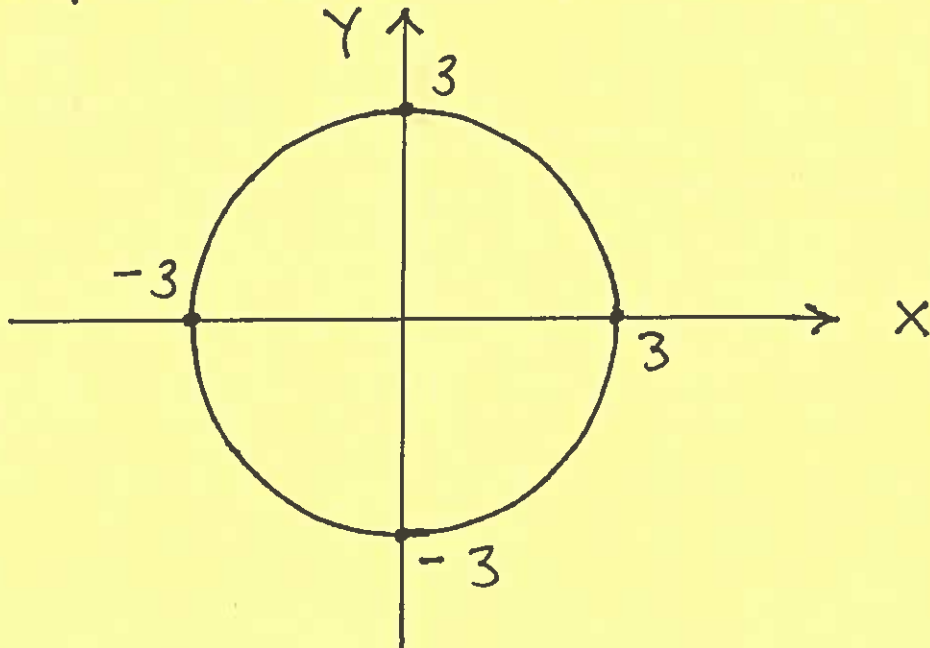
1.) Let $x=0$: $z = y^2 - 9$ (y-z-trace)



2.) Let $Y=0$: $Z = X^2 - 9$ (XZ-trace)



3.) Let $Z=0$: $0 = X^2 + Y^2 - 9 \rightarrow$
 $X^2 + Y^2 = 9 = 3^2$ (XY-trace)



III.) Find Level Curves

Z-values

level curves

-8

$$-8 = x^2 + y^2 - 9 \rightarrow$$
$$\underline{x^2 + y^2 = 1 = 1^2}$$

-5

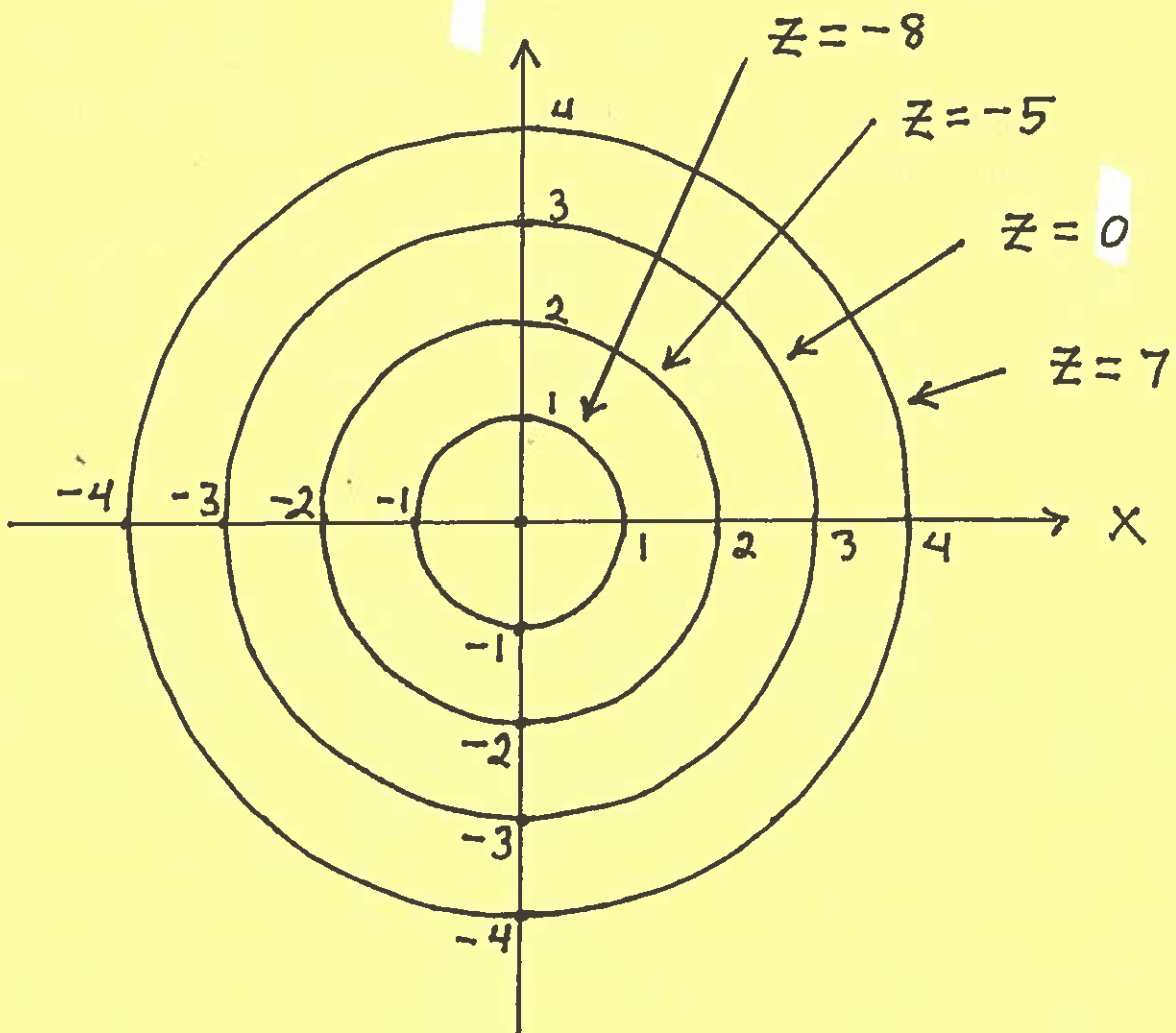
$$-5 = x^2 + y^2 - 9 \rightarrow$$
$$\underline{x^2 + y^2 = 4 = 2^2}$$

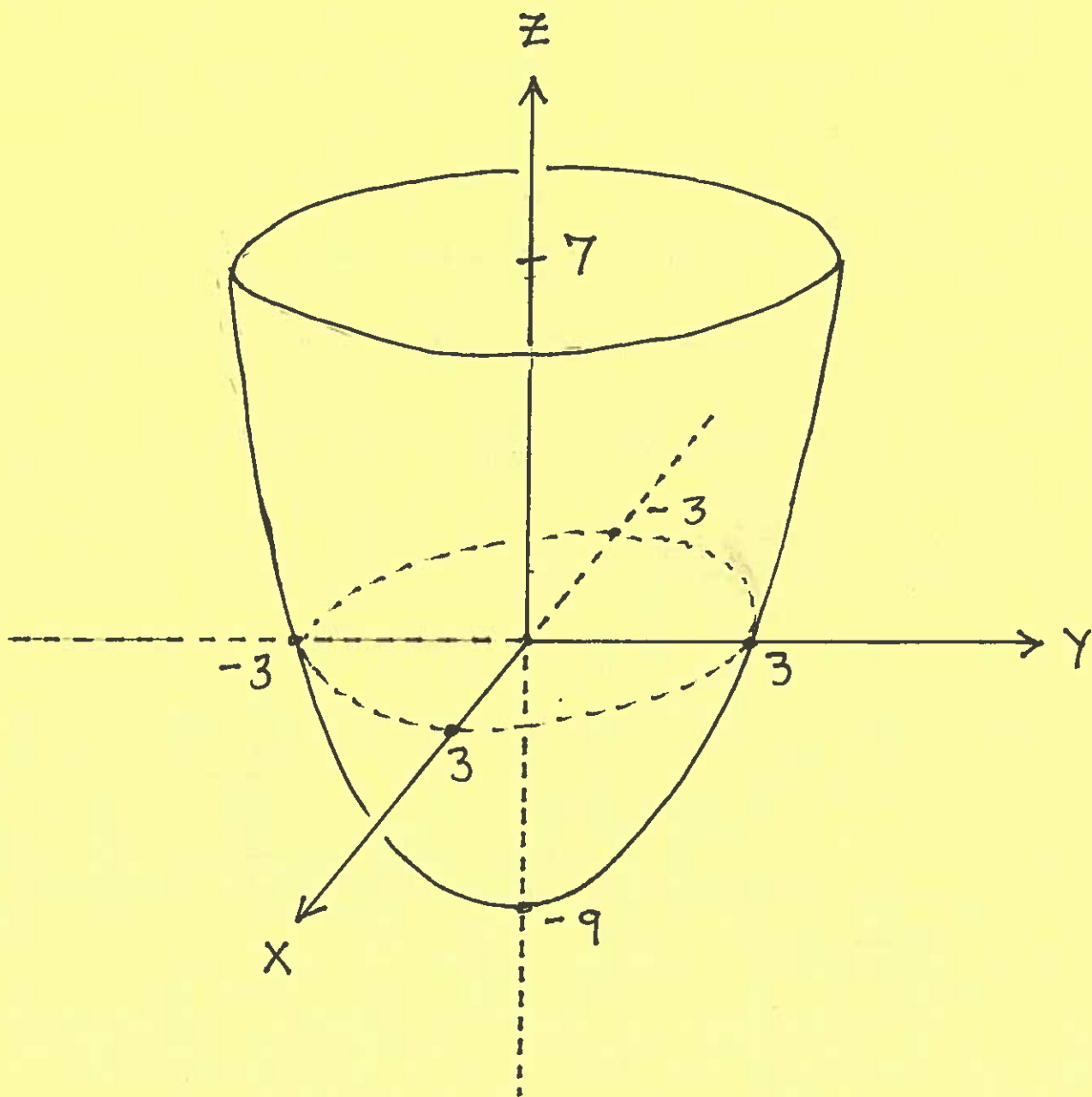
0

$$0 = x^2 + y^2 - 9 \rightarrow$$
$$\underline{x^2 + y^2 = 9 = 3^2}$$

7

$$7 = x^2 + y^2 - 9 \rightarrow$$
$$\underline{x^2 + y^2 = 16 = 4^2}$$





Paraboloid (Bowl)