Discussion Problems for next time

3.1, 3.2 problems on syllabus.

Exam will cover sections 2.1-2.7 and 3.1, 3.2, 3.4

Tentatively scheduled for 9/21.

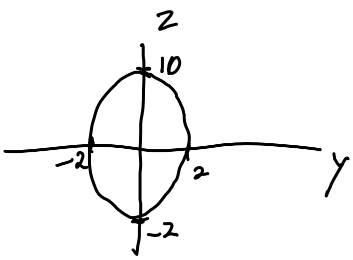
2.6

320 $-4x^2+25y^2+z^2=100$

$x=0$

$25y^2+z^2=100$

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



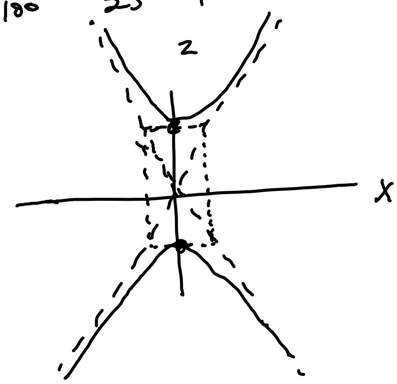
$x=k$

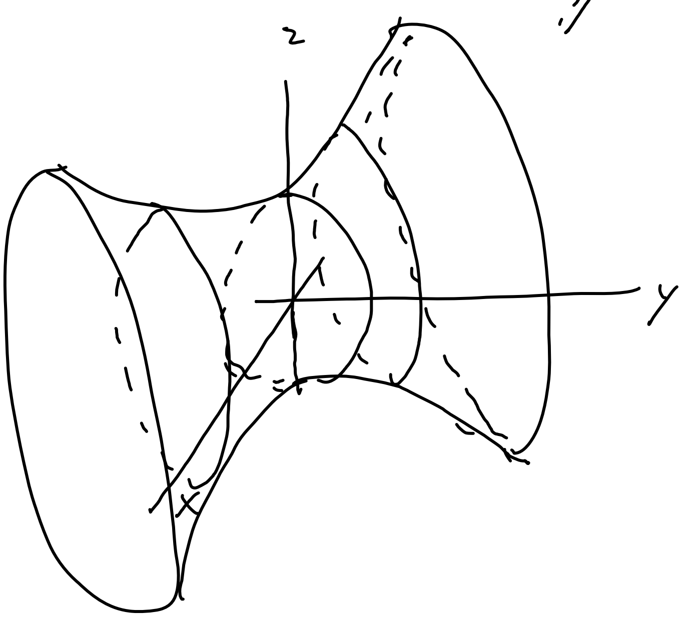
ellipses parallel to the yz-plane.

$y=0$

$-4x^2+z^2=100$

$\frac{z^2}{100}-\frac{x^2}{25}=1$



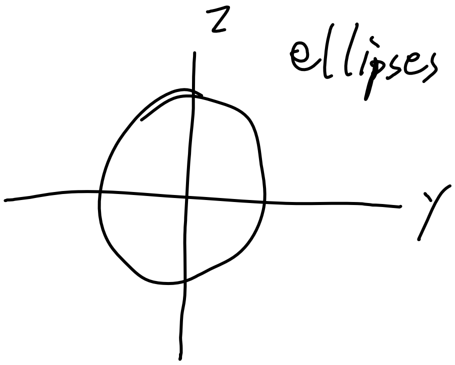


322 $3x^2 - y^2 - 6z^2 = 18$

let $x = k$

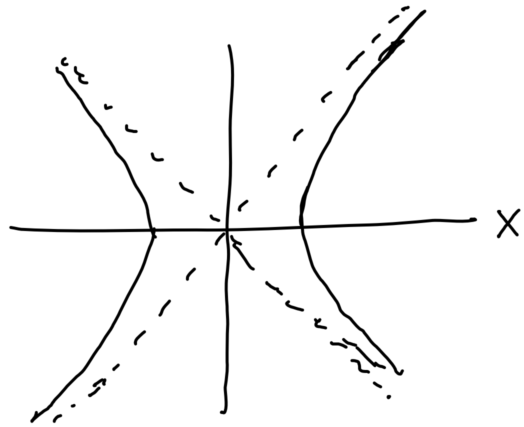
$3k^2 - 18 = y^2 + 6z^2$

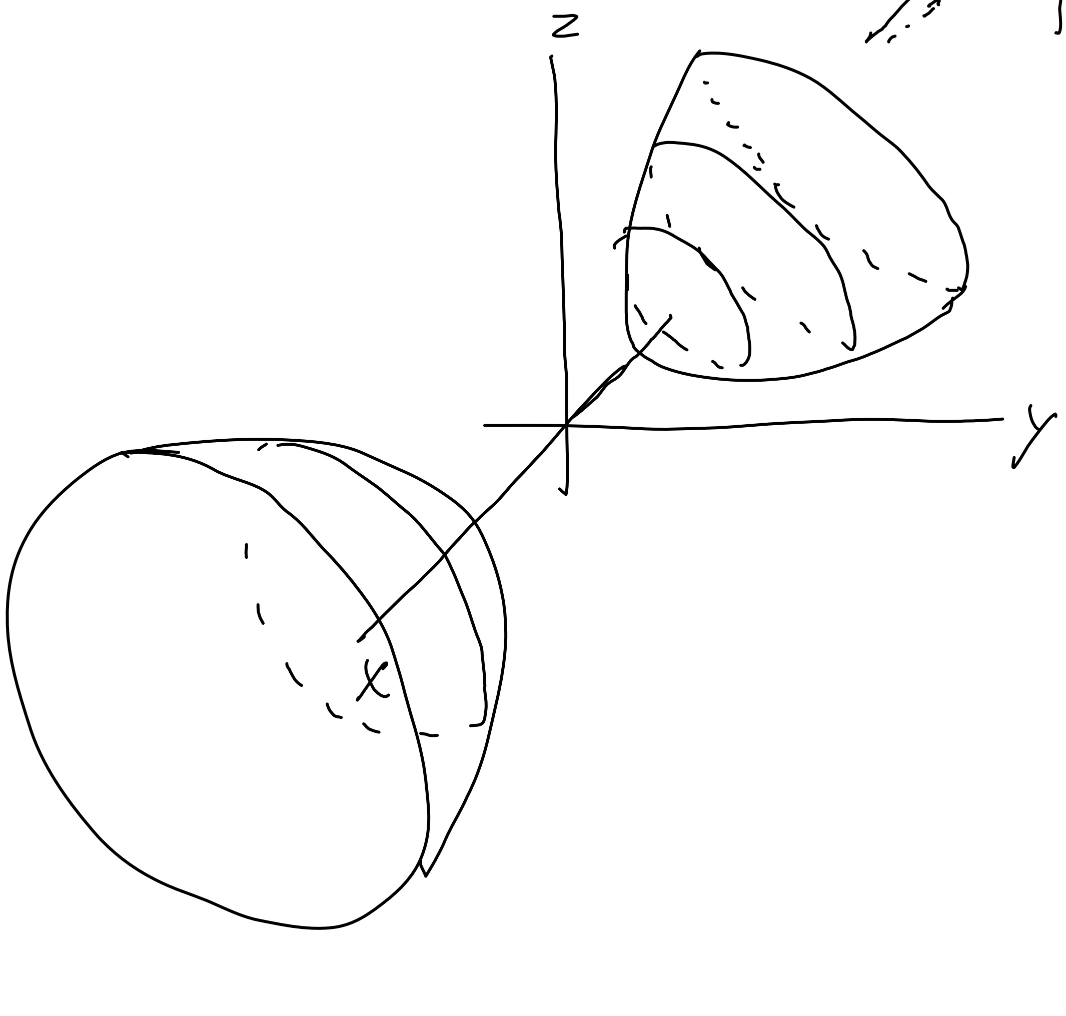
ellipses parallel to yz-plane



$y = 0$

$3x^2 - 6z^2 = 18$





324 $8x^2-5y^2-10z=0$

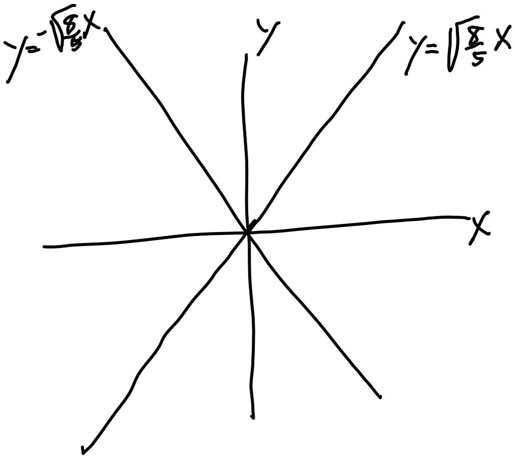
$$8x^2-5y^2=10z$$

$\underline{z=0}$

$8x^2-5y^2=0$

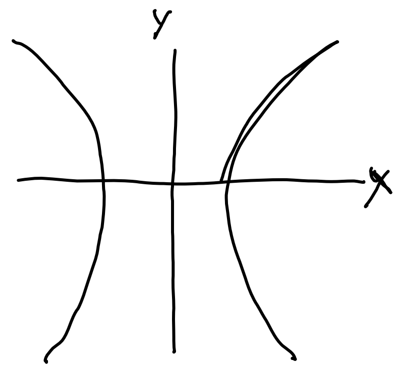
$(\sqrt{8}x-\sqrt{5}y)(\sqrt{8}x+\sqrt{5}y)=0$

$\sqrt{8}x-\sqrt{5}y=0$ OR $\sqrt{8}x+\sqrt{5}y=0$

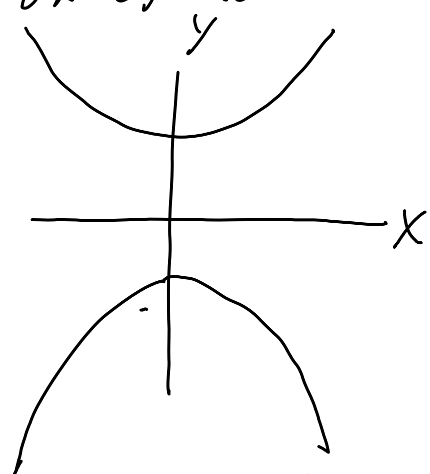


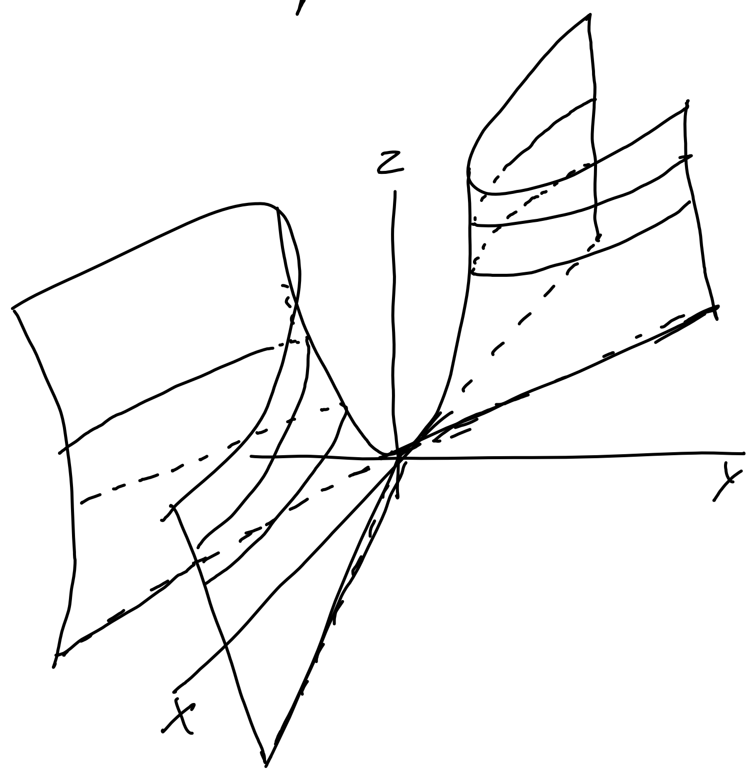
$\underline{z=k>0}$

$8x^2-5y^2=10k$



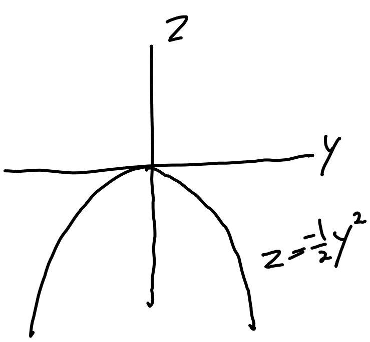
$8x^2-5y^2=-10k$





$\underline{x=0}$

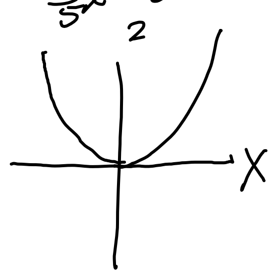
$-5y^2=10z$



$\underline{y=0}$

$8x^2=10z$

$\frac{4}{5}x^2=z$

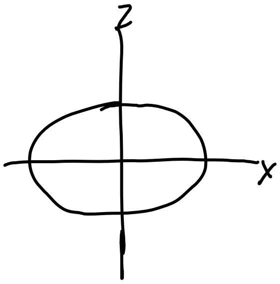


330 $\quad 49y = x^2 + 7z^2$

$\underline{y = k}$

$49k = x^2 + 7z^2$

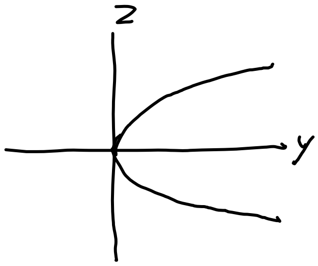
ellipse parallel to xz-plane

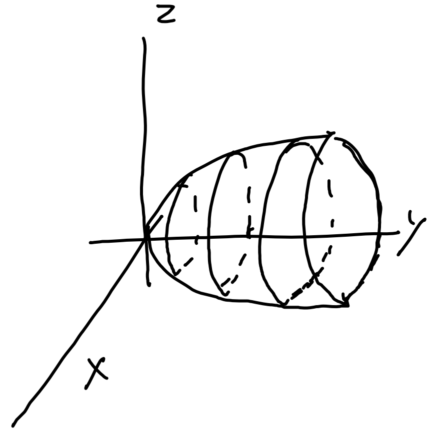


$\underline{x = 0}$

$49y = 7z^2$

$y = \frac{1}{7}z^2$





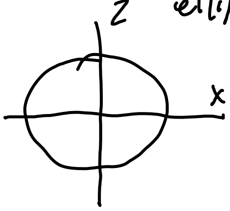
Similar to 330

$y = \sqrt{x^2 + 3z^2}$

$\underline{y = k \geq 0}$

$k^2 = x^2 + 3z^2$

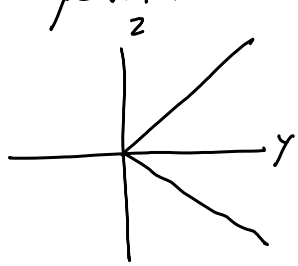
ellipses parallel to xz-plane

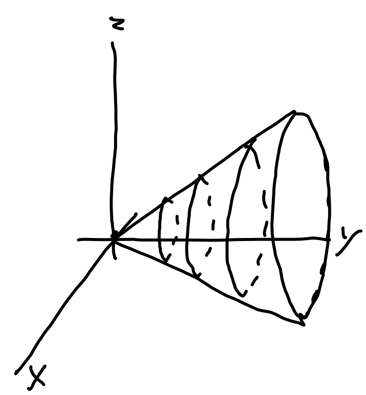


$\underline{x = 0}$

$y = \sqrt{3z^2}$

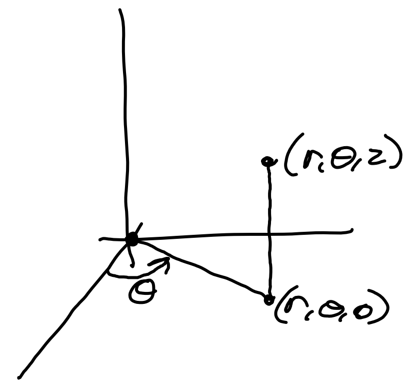
$y = \sqrt{3}|z|$





Sec 2.7

363 $\left(4, \frac{\pi}{6}, 3\right) = (r, \theta, z)$



Transform to rectangular coordinates.

$x = r\cos(\theta)$

$y = r\sin(\theta)$

$z = z$

$x^2 + y^2 = r^2$

$\frac{y}{x} = \tan(\theta)$

$x = 4\cos\left(\frac{\pi}{6}\right) = 2\sqrt{3}$

$y = 4\sin\left(\frac{\pi}{6}\right) = 2$

$z = 3$

$\boxed{(x, y, z) = (2\sqrt{3}, 2, 3)}$

367 $(x\, y\, z) = (1, \sqrt{3}, 2)$

$(r, \theta, z) = \left(2, \frac{\pi}{3}, 2\right)$

$z = 2$

$r^2 = 4$ so $r = 2$

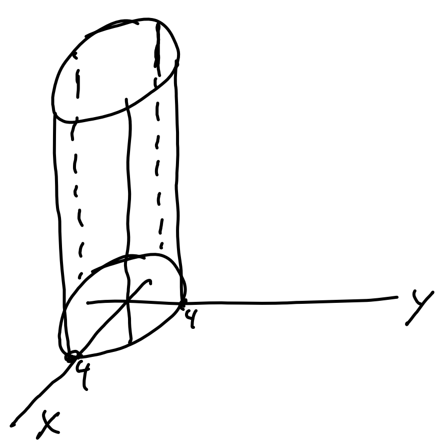
$\tan(\theta) = \sqrt{3} = \frac{\sqrt{3}/2}{1/2}$

$\theta = \frac{\pi}{3}$

371 $r = 4$

$r^2 = 16$

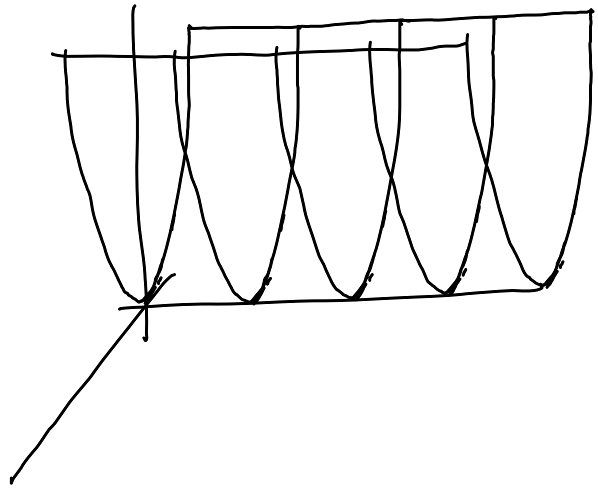
$x^2 + y^2 = 16$



(372) $z = r^2\cos^2(\theta)$

$z = (r\cos(\theta))^2$

$z = x^2$



(375) $r = 2\cos(\theta)$

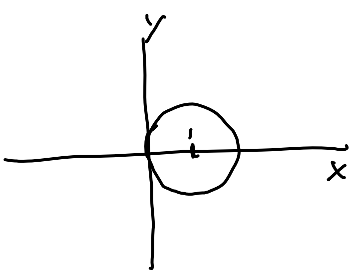
$r^2 = 2r\cos(\theta)$

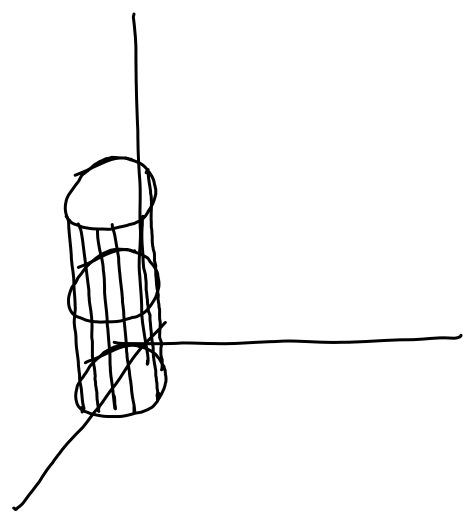
$x^2 + y^2 = 2x$

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

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

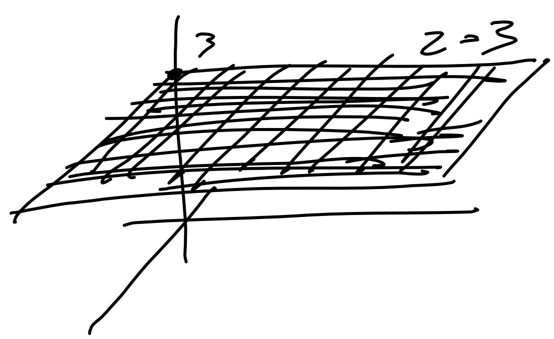
$(x-1)^2 + y^2 = 1$





(379) $z = 3$ in rectangular coordinates.

$z = 3$ in cylindrical coordinates



383 $x^2+y^2-16x=0$

$x^2+y^2=16x$

$r^2=16r\cos(\theta)$

cylinder

$r=16\cos(\theta)$

385 $(3,0,\pi)=(\rho,\theta,\varphi)$

$x=\rho\cos(\theta)\sin(\varphi)=0$

$y=\rho\sin(\theta)\sin(\varphi)=0$

$z=\rho\cos(\varphi)=-3$

390 $(x,y,z)=(-1,2,1)$ find ρ,θ,φ

$\rho^2=x^2+y^2+z^2=6$

$\rho=\sqrt{6}$

$z=\rho\cos(\varphi)$

$1=\sqrt{6}\cos(\varphi)$

$\frac{1}{\sqrt{6}}=\cos(\varphi)$

1.150 radians $\approx\varphi$

$x=\rho\cos(\theta)\sin(\varphi)$

$-1=\sqrt{6}\cos(\theta)\sin(1.150 \text{ radians})$

$-1=2.25381\cos(\theta)$

$\frac{-1}{2.25381}=\cos(\theta)$

2.03 radians $\approx\theta$

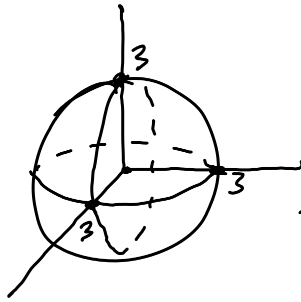
$(\rho,\theta,\varphi)\approx(\sqrt{6},2.03,1.150)$

393

$$\rho = 3$$

$$\rho^2 = 9$$

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



Sphere of radius 3.

396

$$\rho = 4\csc(\varphi)$$

$$\rho = \frac{4}{\sin(\varphi)}$$

$$\rho\sin(\varphi) = 4$$

$$\rho^2\sin^2(\varphi) = 16$$

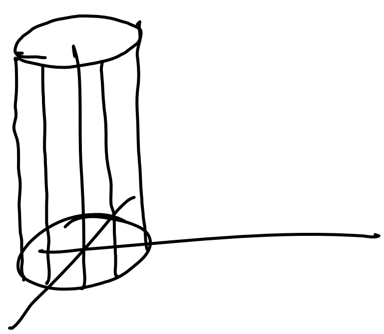
$$\rho^2\left(1-\cos^2(\varphi)\right) = 16$$

$$\rho^2 - \rho^2\cos^2(\varphi) = 16$$

$$\rho^2 - \left(\rho\cos(\varphi)\right)^2 = 16$$

$$x^2+y^2+z^2-z^2 = 16$$

$$x^2+y^2=16$$



399, 401 omit