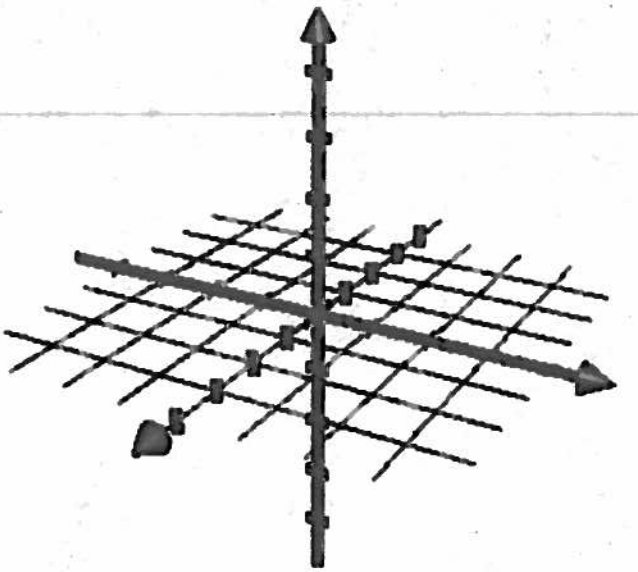
Planes in 3D



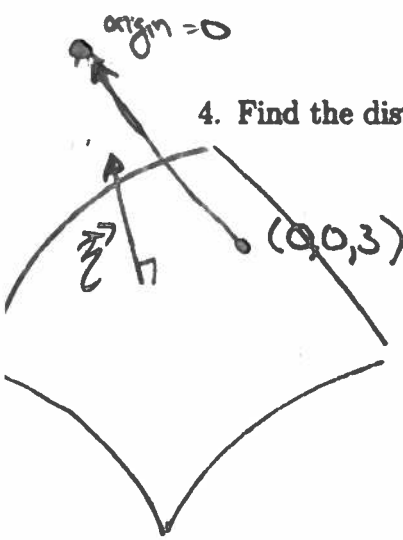
1. Sketch the plane $3x - 2y + 2z = 6$.

2. Where does the line $x = y - 1 = 2z$ intersect the plane $3x - 2y + 2z = 6$?

3. Consider the planes $3x - 2y + z = 1$ and $2x + y - 3z = 3$

   (a) Find the angle between the two planes.

   (b) Find the line of intersection between the two planes.



4. Find the distance from the origin to the plane $3x - 2y + 2z = 6$.

notice the distance from the origin to the plane corresponds to the length of $\vec{PO}$ projected onto $\vec{n}$. Since the magnitude of $\vec{PO}$ projected onto $\vec{n}$ is...

$$\frac{\langle 0,0,3\rangle \cdot \langle 3,-2,2\rangle}{\|\langle 3,-2,2\rangle\|_1^2} = \frac{6}{9+4+4} = \frac{6}{17}$$

§10.5 Conic Sections

- The equation of a *parabola* with focus $(0, p)$ and directrix $y = -p$ is

$$x^2 = 4py.$$

The equation of a parabola with focus $(p, 0)$ and directrix $x = -p$ is

$$y^2 = 4px.$$

- The ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, \qquad a \geq b > 0$$

has foci $(\pm(a^2 - b^2), 0)$ and vertices $(\pm a, 0)$, $(\pm b, 0)$.

- The hyperbola

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1, \qquad a \geq b > 0$$

has foci $(\pm(a^2 + b^2), 0)$ and vertices $(\pm a, 0)$ and asymptotes $y = \pm(b/a)x$.

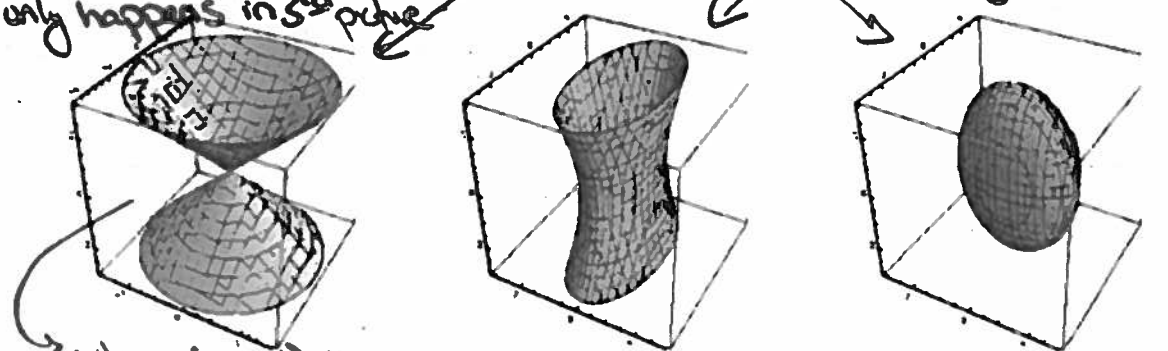
3D Conic Sections

Match each function to its graph

$9x^2+36y^2+4z^2 = 36$ $\qquad$ $4x^2+9y^2-4z^2 = 0$ $\qquad$ $36x^2+9y^2-4z^2 = 36$

for $x=0$ $\Rightarrow$ $36y^2+4z^2=36$ has ellipse level curves which only happens in 3rd picture

for $x=0$ $\Rightarrow$ $9y^2-4z^2=36$ has hyperbola level curves



notice $(0,0,0)$ is on the graph but $(0,0,0)$ only satisfies the second equation

$9\cdot0^2+36\cdot0^2+4\cdot0^2=0\neq36$

$4\cdot0^2+9\cdot0^2-4\cdot0=0$

$36\cdot0^2+9\cdot0^2-4\cdot0^2=0\neq36$