13. 6. 54

$$x^2 + y^2 + 7z^2 + 12x = -35$$

$$x^2 + 12x + 36 + y^2 + 7z^2 = -35 + 36$$

$$(x+6)^2 + y^2 + 7z^2 = 1$$

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$$

$$(x+6)^2 + y^2 + \frac{z^2}{(\sqrt[1]{7})^2} = 1$$

ellipsoid

Center: $(-6, 0, 0)$

length in   x-direction: 2
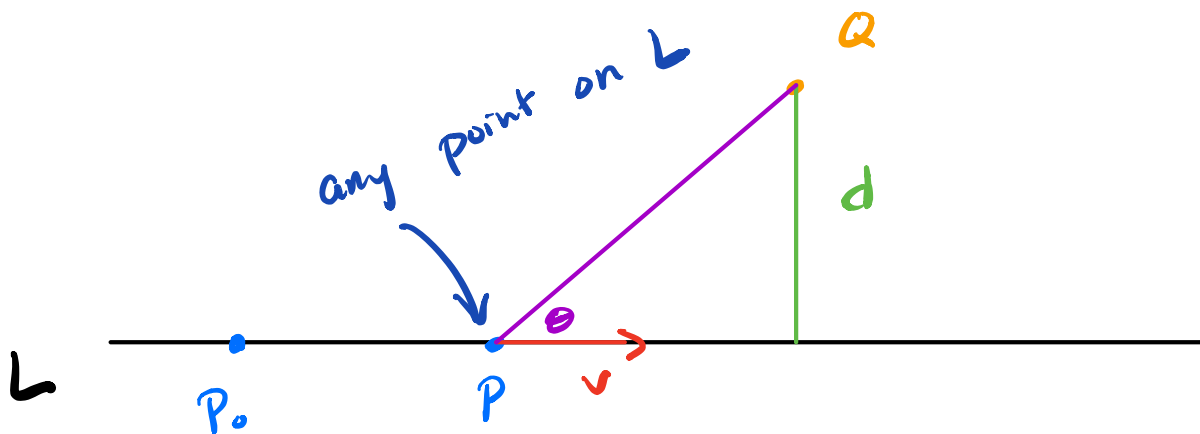y-direction: 2
z-direction: $\frac{2}{\sqrt{7}}$

13.5 eqn of line: $\vec{r}(t) = \vec{r}_0 + t\vec{v}$

initial — parallel to line

remember $\vec{r}(t) = \langle x(t), y(t), z(t) \rangle$

But think in terms of $\vec{r}(t)$

Given line L: $r(t) = r_0 + tv$, point Q

what is the distance from L to Q?

$$d = |\overline{PQ}| \sin\theta$$

$$|\vec{v} \times \overline{PQ}| = |v||\overline{PQ}| \sin\theta$$
$$= |v| d \longrightarrow d = \frac{|\vec{v} \times \overline{PQ}|}{|\vec{v}|}$$

Ex   dst   from $Q(1,0,3)$ to

$$r(t) = \underbrace{\langle -1, 0, 1 \rangle}_{P} + t \underbrace{\langle 3, 2, 1 \rangle}_{v}$$

$$d = \frac{|\langle 3, 2, 1 \rangle \times \langle 2, 0, 2 \rangle|}{|\langle 3, 2, 1 \rangle|}$$
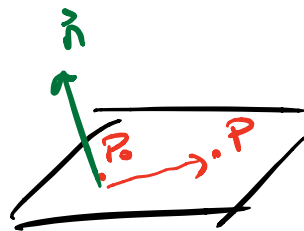
What defines a line?   A point and a direction

What defines a plane?   A point and a
                                            normal vector
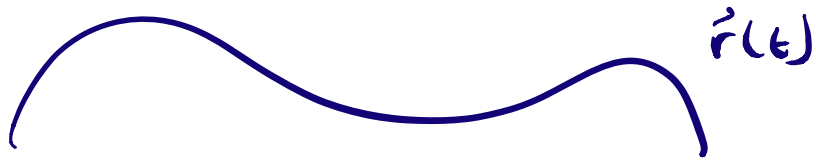
$$a(x - x_0) + b(y - y_0) + c(z - z_0) = 0$$

$$\vec{n} = \langle a, b, c \rangle$$
$$\vec{P_0} = (x_0, y_0, z_0)$$

13.6   What is a cylinder

Defined by any plane curve,

$\dot{r}(t)$

the "sheet" that follows that
curve

Know   Table 13.1