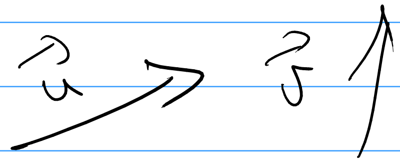
Math 344

Ch 10 Review



Ops: $\vec{v} \pm \vec{u}$

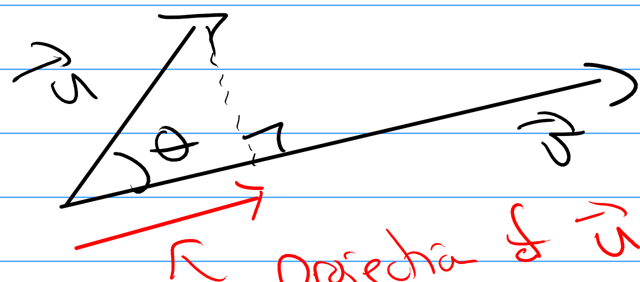
$c\vec{v}$

Products: Dot $\vec{u} \cdot \vec{v} = |\vec{u}||\vec{v}|\cos\theta$

$$= \sum_{i=1}^{n} u_i v_i$$

why?: Work $= \vec{F} \cdot \vec{D}$

projection:

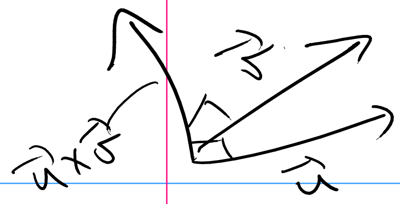


Vector: $\text{proj}_{\vec{v}}(\vec{u}) = \dfrac{\vec{u} \cdot \vec{v}}{|\vec{v}|^2}\vec{v}$

Scalar: $\text{comp}_{\vec{v}}(\vec{u}) = \dfrac{\vec{u} \cdot \vec{v}}{|\vec{v}|}$

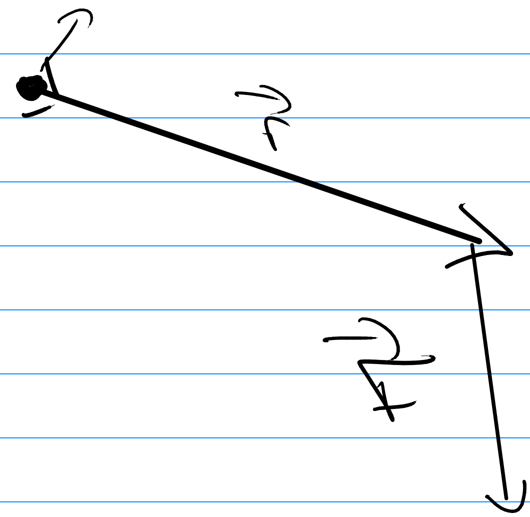
Cross Product: ($\mathbb{R}^3$)

$$\vec{u} \times \vec{v} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ u_1 & u_2 & u_3 \\ v_1 & v_2 & v_3 \end{vmatrix} = \langle u_2v_3 - u_3v_2,\ u_3v_1 - u_1v_3,\ u_1v_2 - u_2v_1 \rangle$$



$$|\vec{u} \times \vec{v}| = |\vec{u}||\vec{v}| \sin\theta$$

$$\vec{\tau} = \vec{r} \times \vec{F}$$



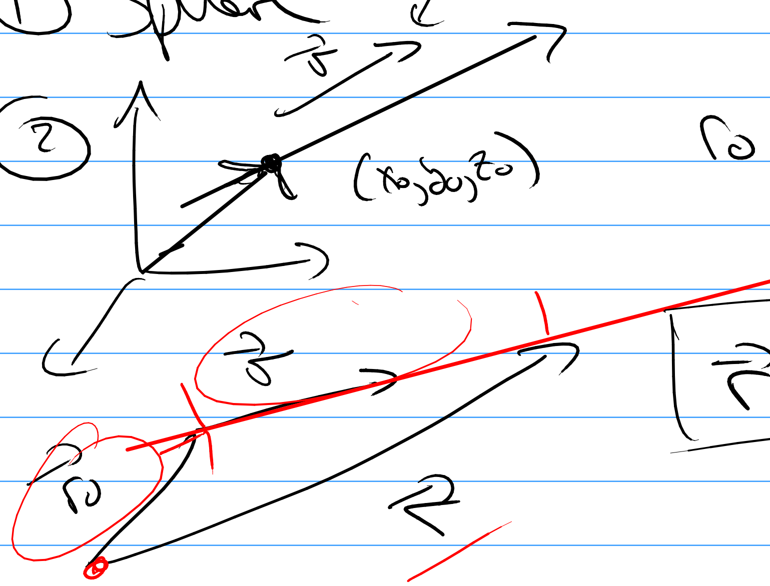
Objects in $\mathbb{R}^3$

① Sphere

②

parallel to line

$v = \langle a, b, c \rangle$



$r_0 = \langle x_0, y_0, z_0 \rangle$

$$\boxed{\vec{r} = \vec{r_0} + t \cdot \vec{v}}$$

Vector form.

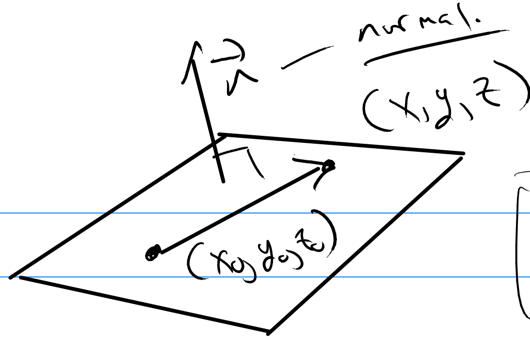
Parametric

$$x = x_0 + at$$
$$y = y_0 + bt$$
$$z = z_0 + ct$$

$$\frac{x - x_0}{a} = \frac{y - y_0}{b} = \frac{z - z_0}{c}$$

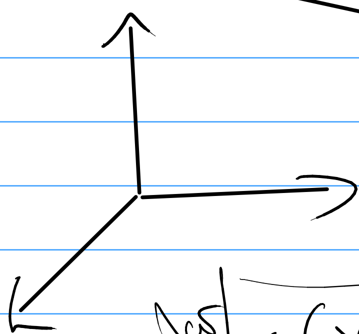
Symmetric

Plane



$$\vec{n} \cdot (\vec{r} - \vec{r}_0) = 0$$

Vector



$n = \langle a, b, c \rangle$

scalar $a(x - x_0) + b(y - y_0) + c(z - z_0) = 0$

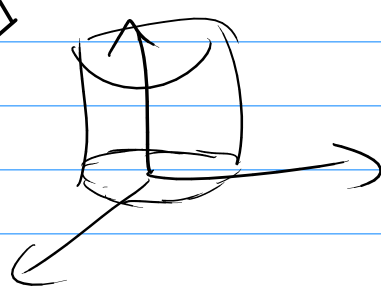
$$ax + by + cz + d = 0$$

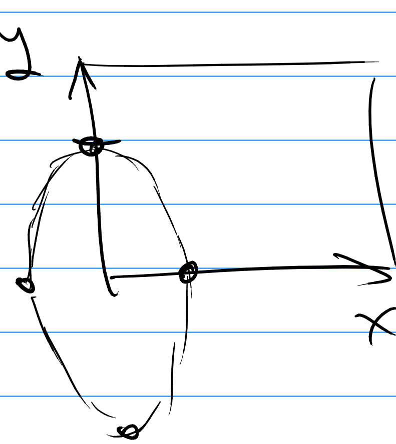
linear eqn

Cylinder

Normally: two variables given..

$$x^2 + \frac{y^2}{4} = 1 \quad \text{in } \mathbb{R}^3$$





Quadratic Surface

← up to powers of 2 for x, y, z

$$Ax^2 + By^2 + Cz^2 + Dxy + Exz + Fyz + Gx + Hy + Jz + K = 0$$

rotations / translations (pick a smart axis)

$$Ax^2 + By^2 + Cz^2 + D = 0 \leftarrow$$

$$Ax^2 + By^2 + Cz = 0$$

p. 578 table 1

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} - 1 = 0$$

$$-\frac{z^2}{c^2} + \frac{x^2}{a^2} + \frac{y^2}{b^2} = 0$$