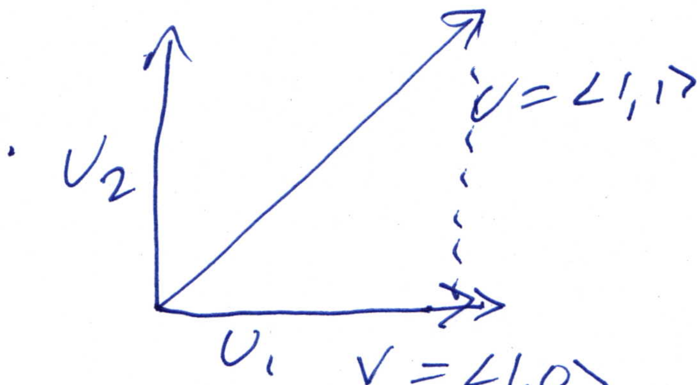
Slide 1
2/11



$\underline{v = \langle 1,0 \rangle}$

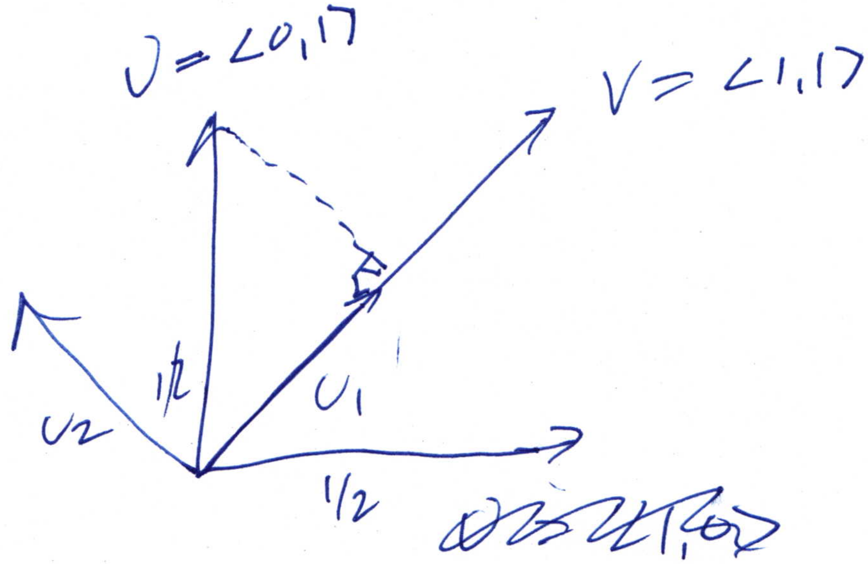
$$v \cdot v = \langle 1,1 \rangle \cdot \langle 1,0 \rangle$$
$$= 1$$

rectilinear vectors
aligned with axes

$U1 = \langle 1,0 \rangle$

$U2 = \langle 0,1 \rangle$

Slide 2



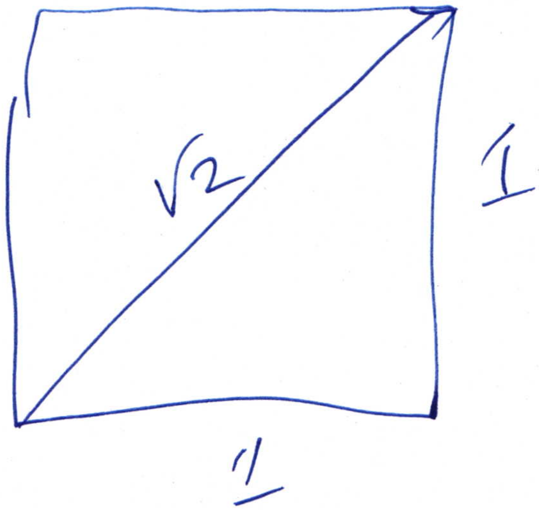
$$u_1 = \frac{\langle 0,1\rangle \cdot \langle 1,1\rangle}{\langle 1,1\rangle \cdot \langle 1,1\rangle}\langle 1,1\rangle$$

$$= \langle \tfrac{1}{2}, \tfrac{1}{2}\rangle$$

$$u_2 = u - u_1 = \langle 0,1\rangle - \langle \tfrac{1}{2}, \tfrac{1}{2}\rangle$$

$$= \langle -\tfrac{1}{2}, \tfrac{1}{2}\rangle$$

Slide 3

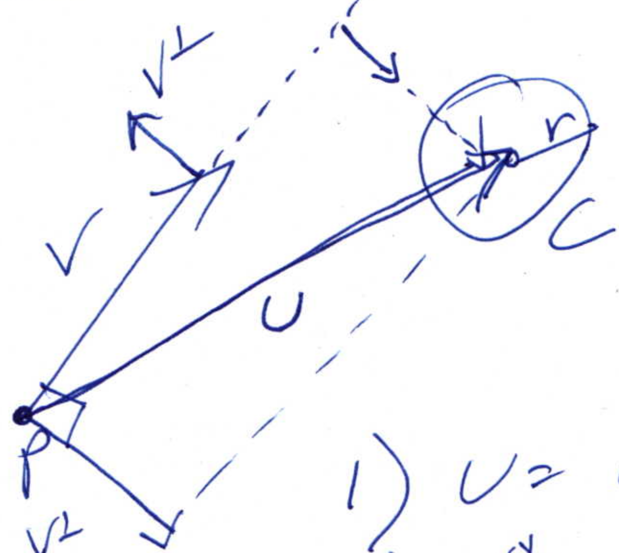


Slide 4

- Trig
- Line equation

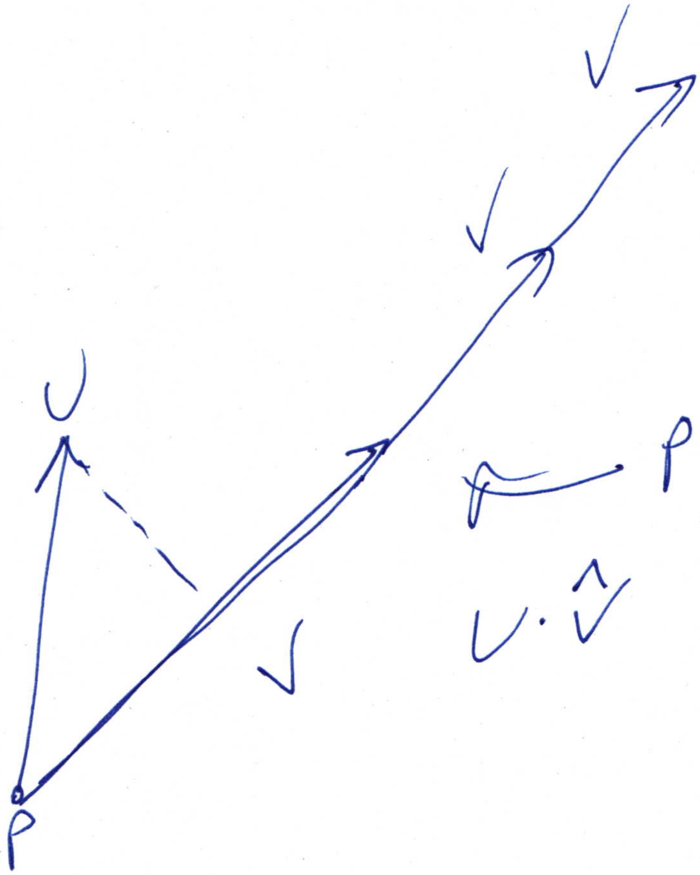
$$p(t) = \langle p_x + t v_x, \; p_y + t v_y \rangle \longrightarrow x^2 + y^2 = R$$

- orthonormal projection



1) $u = c - p$
2) $v^\perp$ = perp of v
3) $\hat{v}^\perp = \frac{v^\perp}{|v^\perp|}$
4)

Slide 5

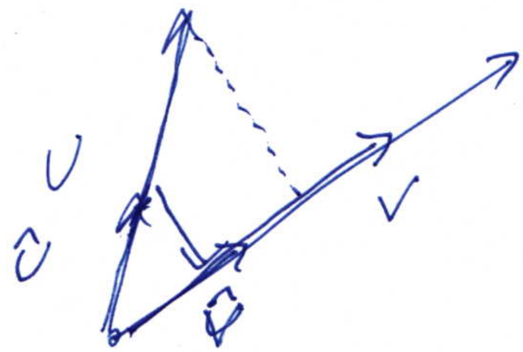


$p(t) = p + tv$

$u \cdot \hat{v}$

$$p(t) = p + tv$$

Slide 6

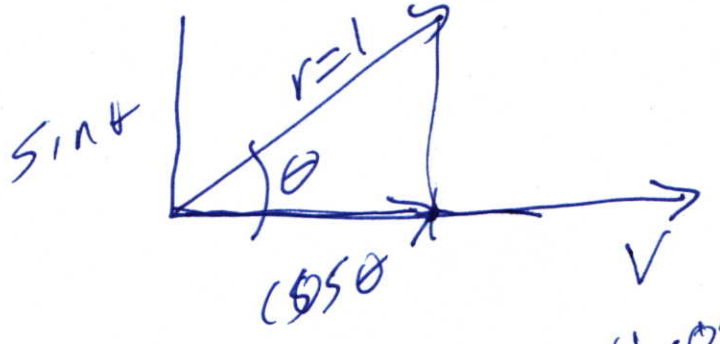


$$u \cdot v = (|u|\hat{u}) \cdot (|v|\hat{v})$$
$$= \underline{|u||v|}\, \hat{u} \cdot \hat{v}$$

$$u \cdot \hat{v} = |u|\, \underline{\hat{u} \cdot \hat{v}}$$

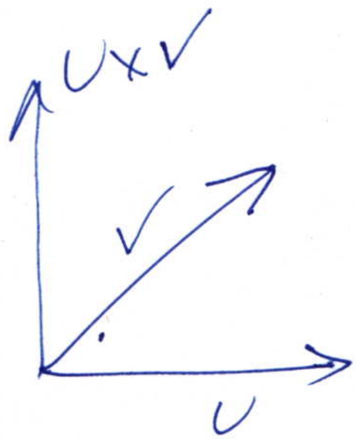
$$\underline{u \cdot v = |u||v| \cos\theta}$$

$|v|\cos\theta$



$\underline{|v|\cos\theta}$

Slide 7



$e_x = \langle 1, 0, 0 \rangle$
$e_y = \langle 0, 1, 0 \rangle$
$e_z = \langle 0, 0, 1 \rangle$

Calculating the cross product

$$\vec{U} \times \vec{V} = \begin{vmatrix} \vec{e}_x & \vec{e}_y & \vec{e}_z \\ U_x & U_y & U_z \\ V_x & V_y & V_z \end{vmatrix}$$

$$= \vec{e}_x \begin{vmatrix} U_y & U_z \\ V_y & V_z \end{vmatrix} - \vec{e}_y \begin{vmatrix} U_x & U_z \\ V_x & V_z \end{vmatrix}$$

$$+ \vec{e}_z \begin{vmatrix} U_x & U_y \\ V_x & V_y \end{vmatrix}$$

$$= e_x (U_y V_z - V_y U_z)$$
$$- e_y (U_x V_z - U_z V_x)$$
$$+ e_z (U_x V_y - U_y V_x)$$

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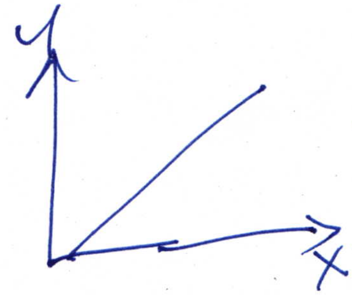
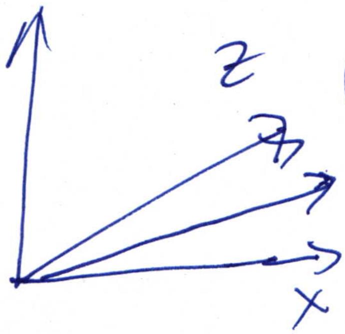


$x \times y = z$



$\langle 1,0,1\rangle$ $\quad e_x \times \langle 1,0,1\rangle$

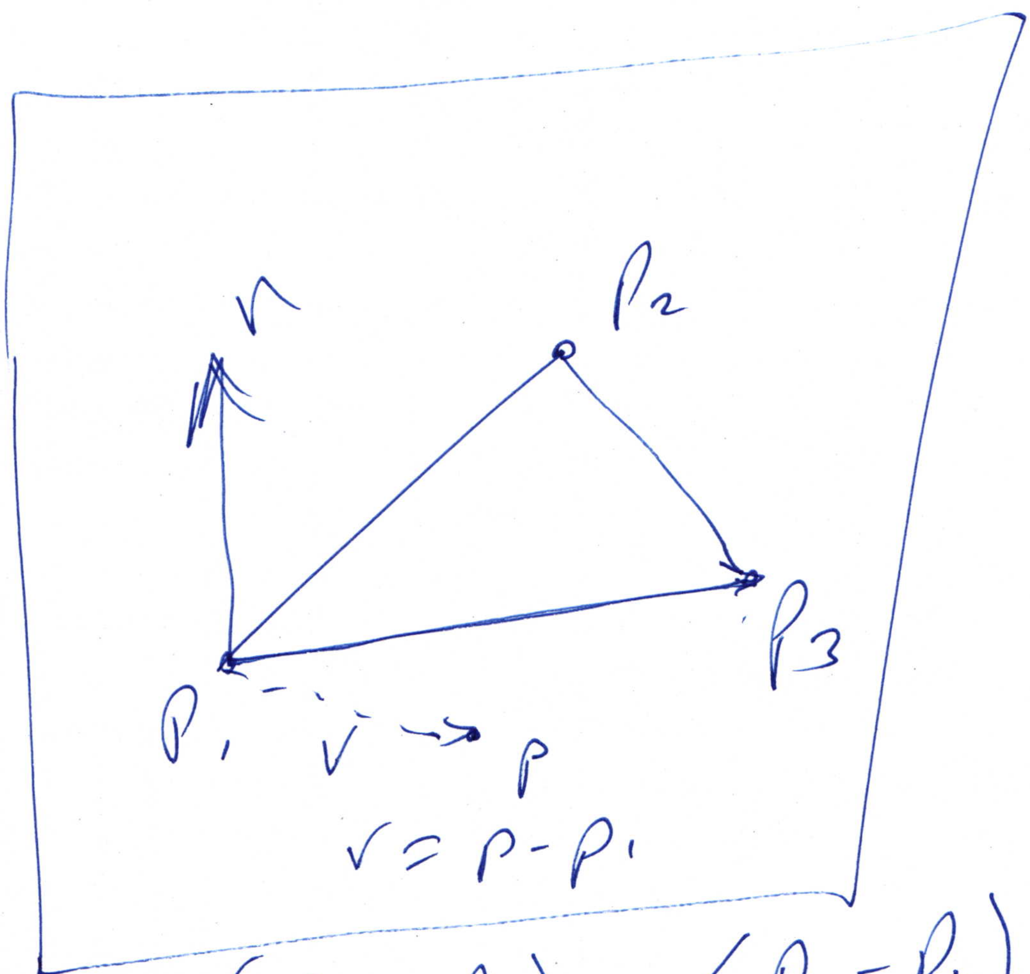
$\langle 1,0,0\rangle$ $\quad \langle 1,0,0\rangle \times \langle 1,0,1\rangle$

1) $e_x \times e_y = \langle 1,0,0\rangle \times \langle 0,1,0\rangle$

$$\begin{vmatrix} e_x & e_y & e_z \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{vmatrix} = e_x \cdot 0 + e_y \cdot 0 + e_z \cdot 1 = \langle 0,0,1\rangle$$

2) $$\begin{vmatrix} e_x & e_y & e_z \\ 1 & 0 & 0 \\ 1 & 0 & 1 \end{vmatrix} = -e_y$$

Slide 9



$$(p_3 - p_1) \times (p_2 - p_1)$$

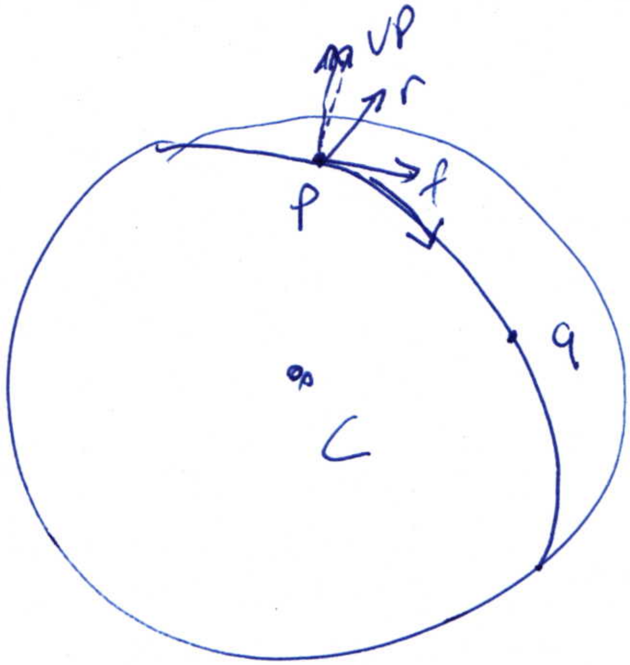
$$n \cdot v = 0$$

$$n \cdot (p - p_1) = 0$$

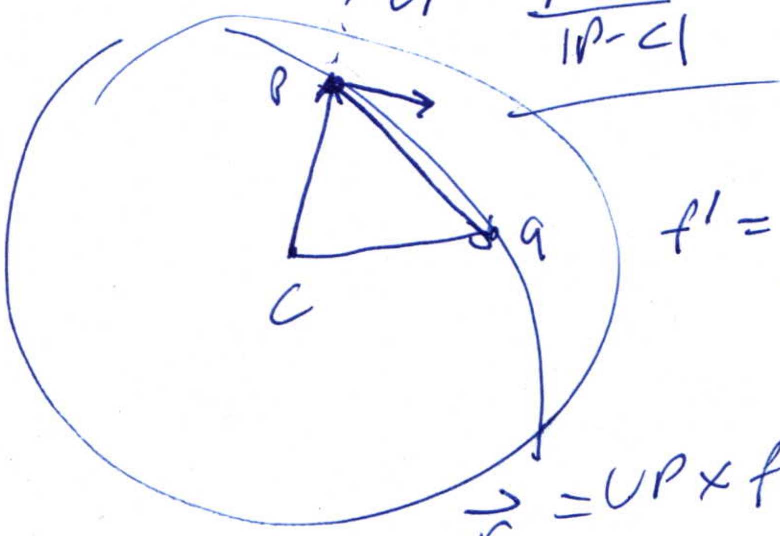
$$n \cdot p - \underbrace{n \cdot p_1}_{\text{constant}} = 0$$

$$n \cdot p = n \cdot p_1$$

Slide 10



$$\hat{up} = \frac{p-c}{|p-c|}$$

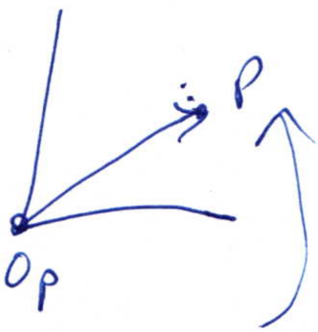


$$f' = \frac{q-p}{|q-p|}$$

$$\vec{r} = up \times f'$$

$$\vec{f} = r \times up$$

Slide 11



$$P = (x, y, 1)$$
$$= x\vec{v}_0 + y\vec{v}_1 + 1 \cdot O_p$$

$$V = P_1 - P_2$$
$$= (x_1, y_1, 1) - (x_2, y_2, 1)$$
$$= \langle x_1 - x_2, y_1 - y_2, \underline{0} \rangle$$

V = P minus P

$$P = V + P$$

$$P + P = \langle x_1, y_1, 1\rangle + \langle x_2, y_2, 1\rangle$$
$$= \langle x_1 + x_2, y_1 + y_2, 2\rangle$$