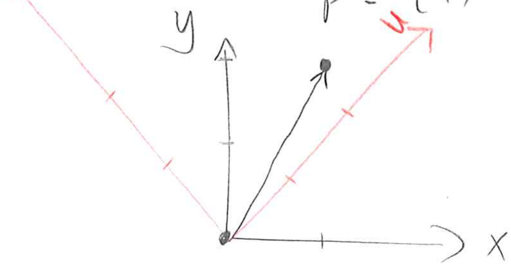
Change of Basis - Reminder

$\vec{p} = (1,2)$



Really means:

$\vec{p} = 1 \cdot e_1 + 2 \cdot e_2$, where

$e_1 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \; e_2 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

$\vec{p}$ is expressed in this <u>canonical</u> basis

Express $\vec{p}$ in a different basis:

(u, v)

$p = (2.1, .13)$

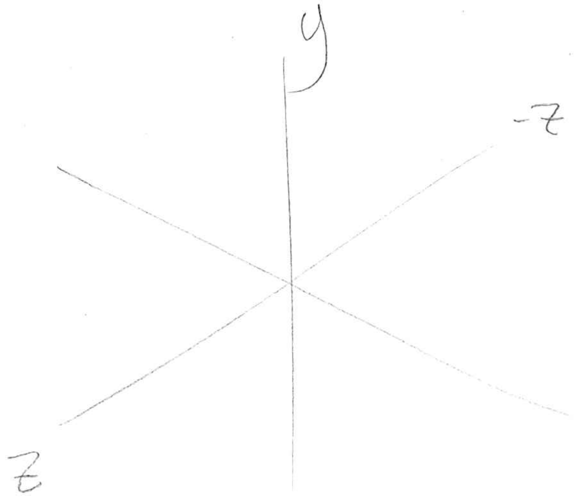
Convert back to canonical, express $\vec{u}$, $\vec{v}$ in terms of e_1, e_2

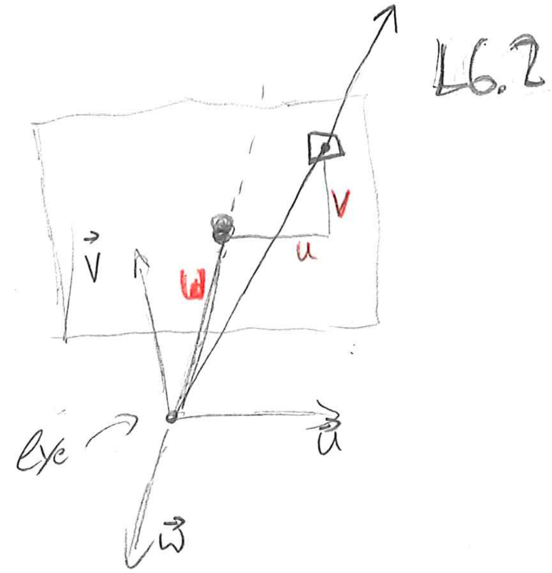
$\vec{p} = 2.1\vec{u} + 0.13\vec{v}$

$= [1, 2]$

Foreshadow: this can be written with matrices:

$$\vec{p} = \begin{bmatrix} | & | \\ \vec{u} & \vec{v} \\ | & | \end{bmatrix} \begin{bmatrix} u \\ v \end{bmatrix}$$





1. Turn (i, j) into (u, v) as before

2. Origin = eye

   direction = $u \cdot \vec{u} + v \cdot \vec{v} + -d \cdot \vec{w}$

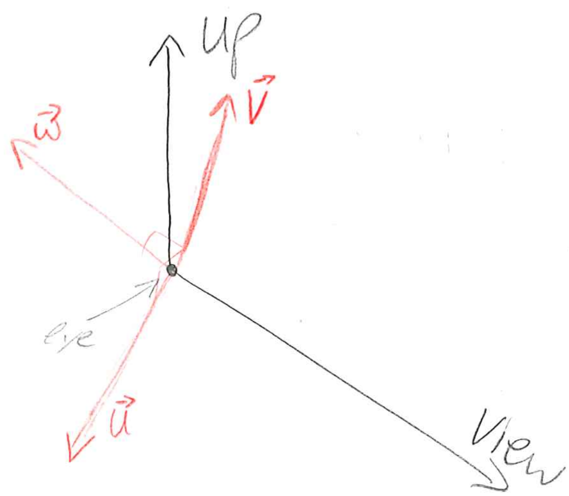
Finding a camera basis, given

eye - position of eye

view - direction camera is looking in

up - a vector pointing "up" from the viewer's perspective

1. $\vec{w} \leftarrow \frac{-\text{view}}{\|\text{view}\|}$



2. $\vec{u} \leftarrow \frac{\text{up} \times \vec{w}}{\|\text{up} \times \vec{w}\|}$

3. $\vec{v} \leftarrow \vec{w} \times \vec{u}$