Lighting Revision Notes:

- Ambient = $I_a k_a$
- Diffuse = $I_p k_d \cos\theta$ or $I_p k_d (\hat{L}\cdot\hat{n})$
- Specular = $I_p k_s (\cos\alpha)^n$ or $I_p k_s (\hat{R}\cdot\hat{V})^n$ or $I_p k_s (\hat{H}\cdot\hat{n})^n$

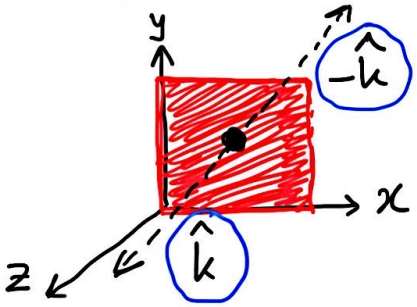
Shininess factor/ specular exponent

- $\hat{R} = 2(\hat{L}\cdot\hat{n})\hat{n} - \hat{L}$
- $\hat{H} = \frac{L+V}{|L+V|}$

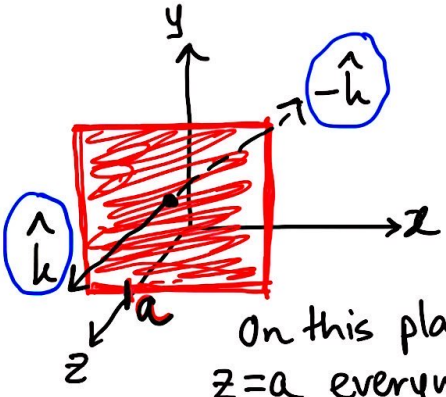
To find unit normal vectors:

For planar surfaces

xy plane / z=0

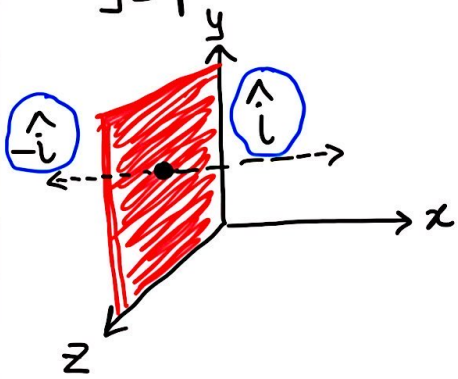


if mentions at z=a, where a can be any value

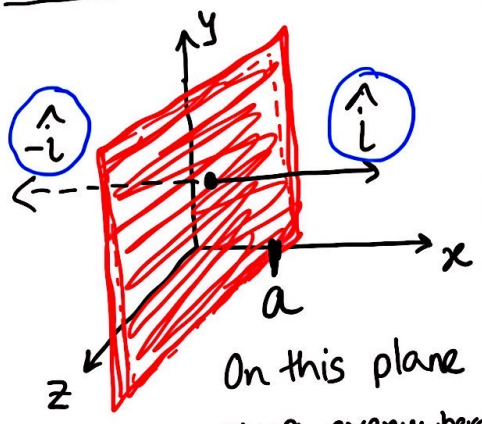


On this plane, z=a everywhere

yz plane / x=0

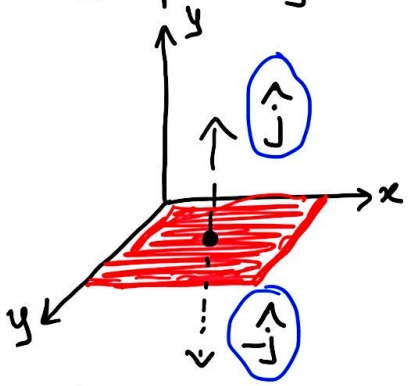


x=a

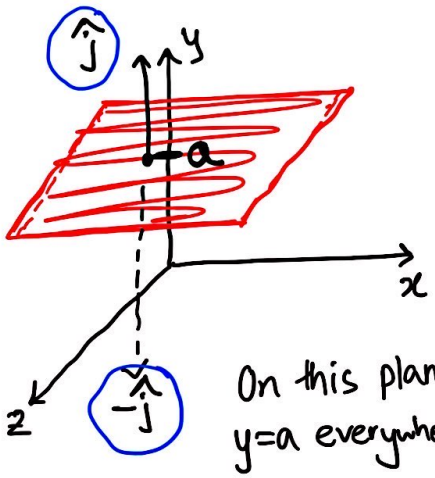


On this plane x=a everywhere

zx plane / y=0



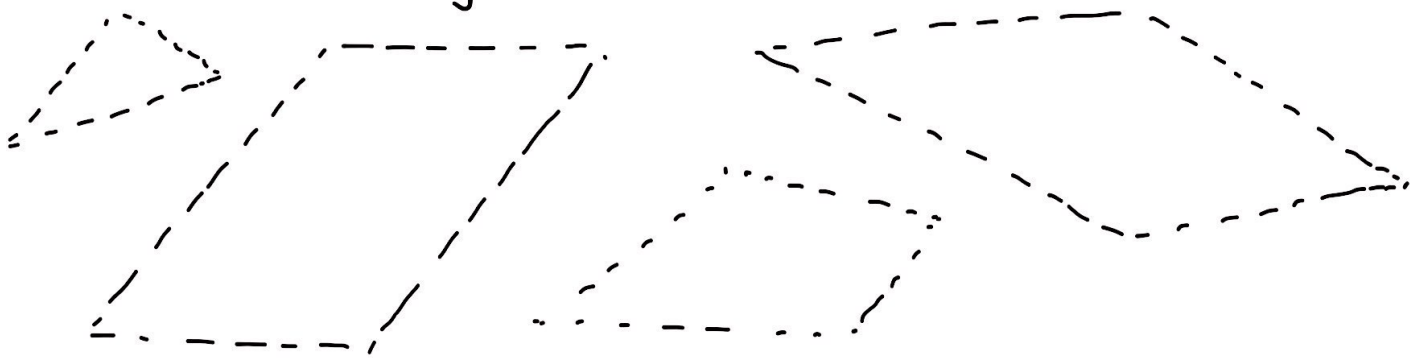
y=a



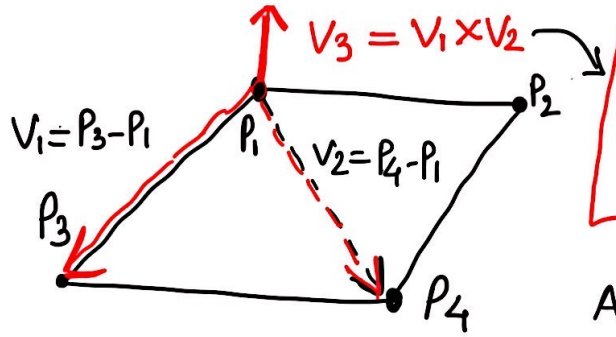
On this plane y=a everywhere

For planar surfaces not aligned with axes

Any arbitrary shape



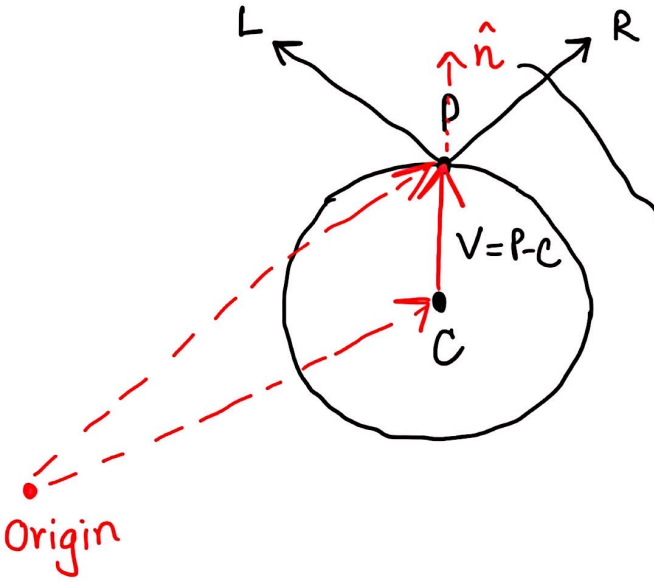
- Take any **2** vectors on the plane and find their **cross product**
- Divide the resultant vector by its magnitude



$$\hat{n} = \frac{V_3}{|V_3|}$$

After normalising this vector, it can be used as the normal vector from any point on this plane

For spherical surfaces

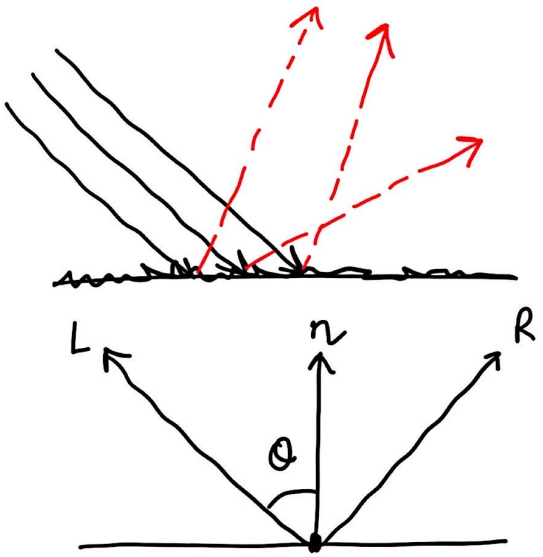


$$\hat{V} = \frac{P-C}{|P-C|}$$

Both vectors point in the same direction & of magnitude 1

$$\therefore \hat{n} = \frac{P-C}{|P-C|}$$

Diffuse Reflection

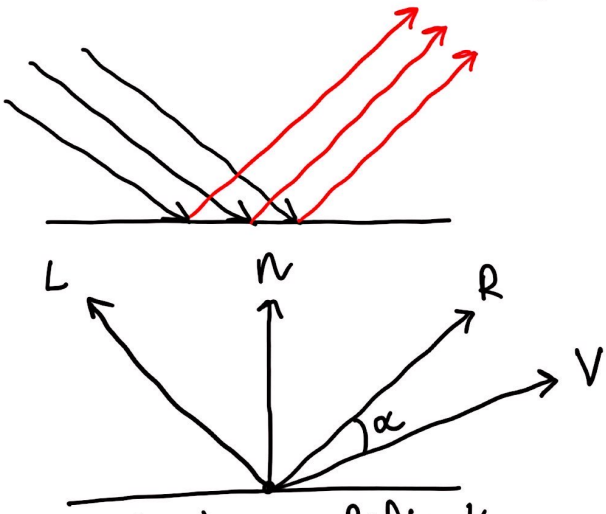


Maximum Reflection

$\theta = 0°$

Specular Reflection

e.g. mirrors



Maximum Reflection

$\alpha = 0°$

or, $\hat{R} = \hat{V}$

viewing vector aligns with the reflected vector