Three Dimensions Lens

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1/v+1/u=1/f

Or, (u+v)/vu=1/f   v=distance of image from the lens

Or, uf+vf=vu   u=distance of object from the lens

Or, uf+vf-vu=0   f= focal lenth of the lens

Or, uf+vf-vu-f2=-f2   [bothside common -f2]

Or, uf-vu+vf-f2=-f2

or, u(f-v)+f(v-f)= -f

or, u(f-v)-f(f-v)= -f2

or,(f-v)(u-f)= -f2

or,(v-f)(u-f)= f^2   [where, (u-f)=x, (v-f)=y].........(A)

or,xy=f^2   [newton formula]

from here 'I' started

1/v+1/u=1/f

Or,(u +v)/vu=1/f

or, (u+v)/vu=f/f^2

or,(v+u)f^2=vuf

or, (v+u)(u-f)(v-f)=vuf   [from (A)]

or,xyz=vuf   [where (u+v)=z]........(B)

'I' get from (B)

xyz=vuf

or, (v+u)(u-f)(v-f)=vuf [putting the valuex,y,z]

or, v^2u+vu^2-vuf-u^2f+vf^2+uf^2-v^2f-vuf=vuf

or,v^2(u-f)+u^2(v-f)+f^2(v+u)=3vuf

or,v^2x+u^2y+f^2z=3vuf.........(C)

NOW,

(u+v-f)^3

={u+(v-f)}^3

=u^3+3u(v-f){u+(v-f)}+(v-f)^3

=u^3+3u(v-f){u+(v-f)+v^3-3vf(v-f)}-f^3

=u^3+v^3-f^3+3(v-f){(u^2+vu-uf-vf)}

= u^3+v^3-f^3+3(v-f){u(u+v)-f(u+v)}

= u^3+v^3-f^3+3(v-f)(uf)(u+v)

= u^3+v^3-f^3+v^2x+u^2y+f^2z ....from(C)

=v^2(v+x)+u^2(u+y)-f^2(f-z)

=v^2(v+u-f)+u^2 (v+u-f)+f^2 (v+u-f))................ [putting the value x,y,z]

=(v+u-f)(v^2+u^2+f^2)

or,(v+u-f)^2=v^2+u^2+f^2 ....(D)

Suppose for a moving object change distance du ,then change in reflectance is dv will be.

In this case the reflection changes respect to the object rate

d/du(v+u-f)^2=d/du(v^2+u^2+f^2)

or, $2(v+u-f)(dv/du+1)=2(dv/du+1)$ [f= constant]

or, $v+u-f=1$

or, $(v+u-f)^2= u^2+v^2+f^2=v+u-f=1$...........(E)

According to the newton formula $f^2=xy$ & same proccess common $-v^2$ & $-u^2$ “I” proved that $v^2=yz$ &$u^2=xz$.

$1\backslash v+1/u=1/f$

Or, $(u+v)\backslash vu=1/f$

Or, $uf+vf=vu$

Or, $uf+vf-vu=0$

Or, $uf-vu+vf-v^2=-V^2$

or, $u(f-v)+v(f-v)= -v^2$

or, $(f-v)(u+v)= -v^2$

or, $(v-f)(v+u)=v^2$...........(F)

$1\backslash v+1/u=1/f$

Or, $(u+v)\backslash vu=1/f$

Or, $uf+vf=vu$

Or, $uf+vf-vu=0$

Or, $uf+vf-vu-u^2=-u^2$

Or, $uf-vu+vf-u^2=-u^2$

or, $f(v+u)-u(v+u)= -u^2$

or, $(f-u)(v+u)= -u^2$

or, $(v+u)(u-f)= u^2$

or, $u^2=xz$..............(G)

NOW,

$x+y+z=u-f+v-f+v+u=2(v+u-f)=2$ [we know that $(v+u-f)=1$]

or, $v+u-f=1/2(x+y+z)$..........(H)

now from the equation (D)

$(v+u-f)^2=v^2+u^2+f^2$

or, $\{1/2(x+y+z)\}^2 = v^2+u^2+f^2$ ...... [from (H)]

or, $(x+y+z)^2=4(v^2+u^2+f^2)$

or, $(x+y+z)^2=4(yz+xz+xy)$

or, $x^2+y^2+z^2=2(xz+yz+xy)$

or, $x^2+y^2+z^2=2(u^2+v^2+f^2)$

or, $x^2+y^2+z^2=2$ [proved]........from (E)