PLANES V1.2

This program from the field of Vector Algebra treats some exercises concerning a plane described by

a\*x + b\*y + c\*z = d in combination with another plane f\*x + g\*y + h\*z = j , a straight line L: [l,m,n] + \*[r,s,t] or a point P [p,o,q]. It determines for:

*PlaneandPlane*: if parallel, the distance, otherwise the intersection line and intersection angle,

*PlaneandLine*: if parallel, the distance, otherwise the intersection point and intersection angle,

*PlaneandPoint*: the distance,

*NormaltoPlane*: finds for a point P [p,o,q] and the normal vector [f,g,h] the equation of the plane in

Coordinate form: f\*x + g\*y + h\*z = [p,o,q]\*[f,g,h],

*Planeby3Points*: finds the equation of the Plane in parametric and coordinate form from three points P1 [a,b,c], P2 [f,g,h] and P3 [k,l,m]. In some cases, the HESSE Normal Form of the equation is edited additionally as HNF : (a\*x + b\*y + c\*z – d)/SQRT(a2 + b2 + c2) = 0.

Besides, the program converts from parametric to coordinate form (*Para2Coor*):

[rx,ry,rz] + \*[sx,sy,sz] + \*[tx,ty,tz] a\*x + b\*y + c\*z = d

and vice versa (*Coor2Para*).

To run the program, select PLANES, then choose one of the sub-programs, which require the following inputs ( cf. definitions above ):

*Planeby3Points*(a,b,c,f,g,h,k,l,m), *PlaneandPlane*(a,b,c,d,f,g,h,j) ,

*PlaneandLine*(a,b,c,d,l,m,n,r,s,t) , *PlaneandPoint*(a,b,c,d,p,o,q), *NormaltoPlane*(p,o,q,f,g,h).

*EXAMPLE 1*: Given are the planes Pl1: x + 5\*y – 3\*z = -2 and Pl2: [0,1,1] + \*[-1/2,-1,1]

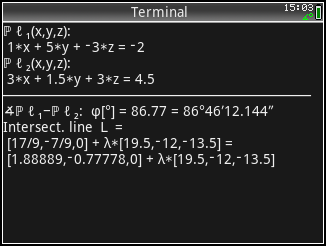
+ \*[-5/2,1,2]. Check their properties.

First change Pl2 to coordinate form. Select PLANES, then *Para2Coor* and complete the brackets:

*Para2Coor*(0,1,1,-.5,-1,1,-2.5,1,2) , ‘Enter’ . Result: Pl(x,y,z): 3\*x + 1.5\*y + 3\*z = 4.5.

Now continue with *PlaneandPlane* and fill in: *PlaneandPlane*(1,5,-3,-2,3,1.5,3,4.5) and press ‘Enter’.

The result is:

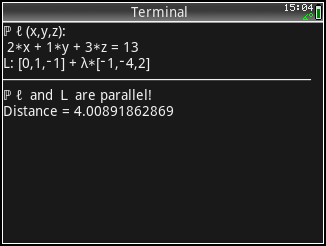


*EXAMPLE 2:*

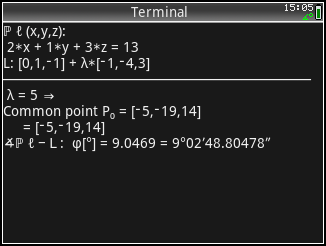
Check the condition between plane Pl1: p1=[1,5,2], n1=[2,1,3] and line L1: [0,1,-1] + \*[-1,-4,2].

First, change Pl1 to coordinate form: *NormaltoPlane*(1,5,2,2,1,3), ‘Enter’, which yields:

Pl1: 2\*x + y +3\*z = 13. Now continue and enter: *PlaneandLine*(2,1,3,13,0,1,-1,-1,-4,2), ‘Enter’ to get the result:



If you change the direction vector of L from [-1,-4,2] to [-1,-4,3], you will get the result:



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