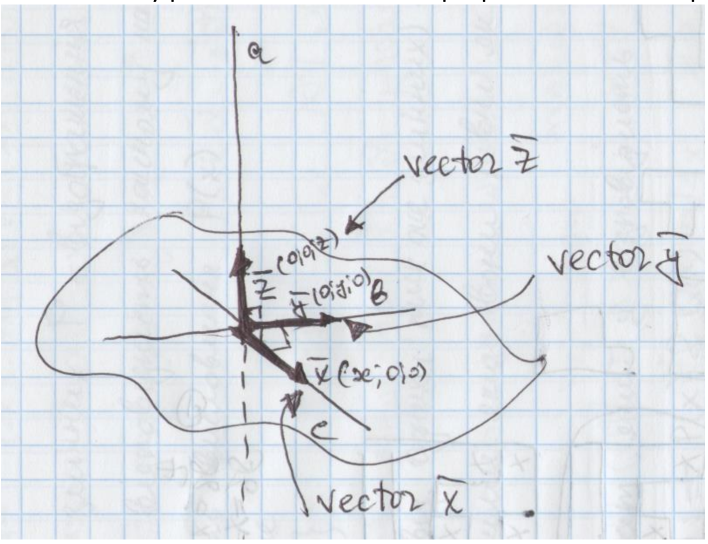
Let's take any plane and a line that is perpendicular to the plane.



Here α is a plane, z – vector that lies on the line a.

<u>Caution. You may have been given one of 2 definitions:</u>

1) A line is perpendicular to plane if and only if it is perpendicular to any 2 lines that pass though the point of intersection of plane and a line.
2) A line is perpendicular to a plane if and only if it is perpendicular to any line in the plane.

Perhaps, you have been given the first definition; otherwise your theorem is definition.

That's why we use the fact that there exist two lines passing through the point of intersection, to which this line is perpendicular. We can take these lines so that they are perpendicular.
x,y – pair of vectors in α with the beginning in point of intersection of plane and line. This vectors lie on that lines c,b.
Obviously – x,y,z –are orthogonal vectors. Moreover, they are linearly independent (they are not coplanar)

So we can take them as a basis for linear orthogonal system of coordinates.

Z has coordinates (0,0,z)
X has coordinates (x,0,0)
Y has coordinates (0,y,0)

Any line in a plane has an equation { px+qy=r & z=0 }

That's why leading vector of any line in α has coordinates (p,q,0)
The leading vector of line which is perpendicular to α has coordinates (0,0,z)
So that inner product of these vectors equals to p*0+q*0+0*z=0, this means that the line, perpendicular to α is perpendicular to any line in a plane α.