MALAGON BAEZA ALAN ADRIAN 6CV2

Assignment 4. Representation of planes

Consider the following vectors:

A=[0 2 0], B=[1 0 1], C=[1 0 -1], D=[-1 0 -1], E=[-1 0 1]

And the triangles ABC and ADE.

1.- Find a representation for the plane defined by ABC.

$$\overrightarrow{AB} = B - A$$

$$= (1-0, 0-2, 1-0)$$

$$= (1, -2, 1)$$

$$\overrightarrow{AC} = C - A$$

$$= (1-0, 0-2, -1-0)$$

$$= (1, -2, -1)$$

$$\vec{N} = \overrightarrow{AB} \times \overrightarrow{AC}$$

$$= \hat{i}((2 \cdot -1) + (1 \cdot 2)) +$$

$$\hat{j}((1 \cdot 1) - (1 \cdot -1)) +$$

$$k((1 \cdot -2) - (-2 \cdot 1))$$

$$= 4\hat{i} + 2\hat{j}$$

$$4(x-0)+2(y-2)+0(z-0)=0$$

$$4x+2y-4=0$$

$$4x+2y=4$$

2.- Find a representation for the plane defined by ADE.

$$\vec{AD}=D-A=(-1-0,0-2,-1-0)$$

$$=(-1,-2,-1)$$

$a_x \quad a_y \quad a_z$

$$\vec{AE}=E-A=(-1-0,0-2,1-0)$$

$$=(-1,-2,1)$$

$b_x \quad b_y \quad b_z$

$$\vec{N}=\vec{AD}\times\vec{AE}=i(-2\cdot1-(-1)(-2))$$

$$+j(-1(-1)-(-1)1)+k(-1(-2)-(-2)(-1))$$

$$=-4i+2j$$

$$-4(x-0)+2(y-2)+0(z-0)=0$$

$$-4x+2y-4=0$$

$$-4x+2y=4$$

3.- What is the angle between ABC and ADE?

$\vec{AB}=(1,-2,1)$ $\vec{AE}=(-1,-2,1)$

$a_x\ a_y\ a_z$ $b_x\ b_y\ b_z$

$$\vec{AB}\times\vec{AE}=i(-2\cdot1-1(-2))+j(1(-1)-1\cdot1)+k(1(-2)-(-2)\cdot1)$$

$$=-2j-4k=(0,-2,-4)$$

$$|\vec{AB}\times\vec{AE}|=\sqrt{(-2)^2+(-4)^2}=\sqrt{4+16}=\sqrt{20}$$

$$|\vec{AB}|=\sqrt{1^2+(-2)^2+1^2}=\sqrt{1+4+1}=\sqrt{6}$$

$$|\vec{AE}|=\sqrt{(-1)^2+(-2)^2+1^2}=\sqrt{1+4+1}=\sqrt{6}$$

$$\frac{\sqrt{20}}{6} = \sin(t)$$

$$t = \sin^{-1}\left(\frac{\sqrt{20}}{6}\right)$$

$$t = 48.19^{\circ}$$

4.- What plane is represented by the point B and the vector N=[0 -1 0] ?

$$0(x-1)+(-1)(y-0)+0(z-1)=0$$

$$-y=0$$

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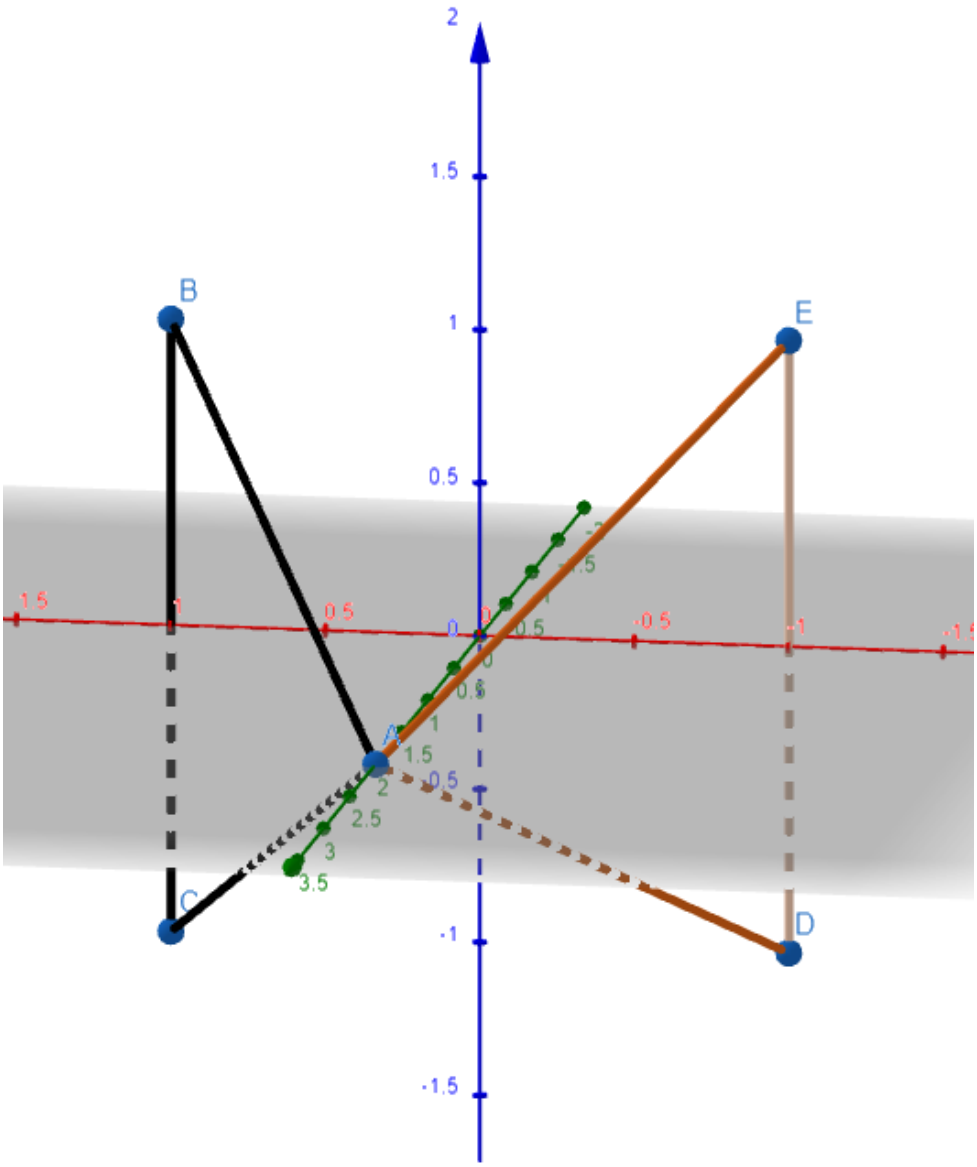
5.- Sketch all vectors used in this assignment

Original Triangles



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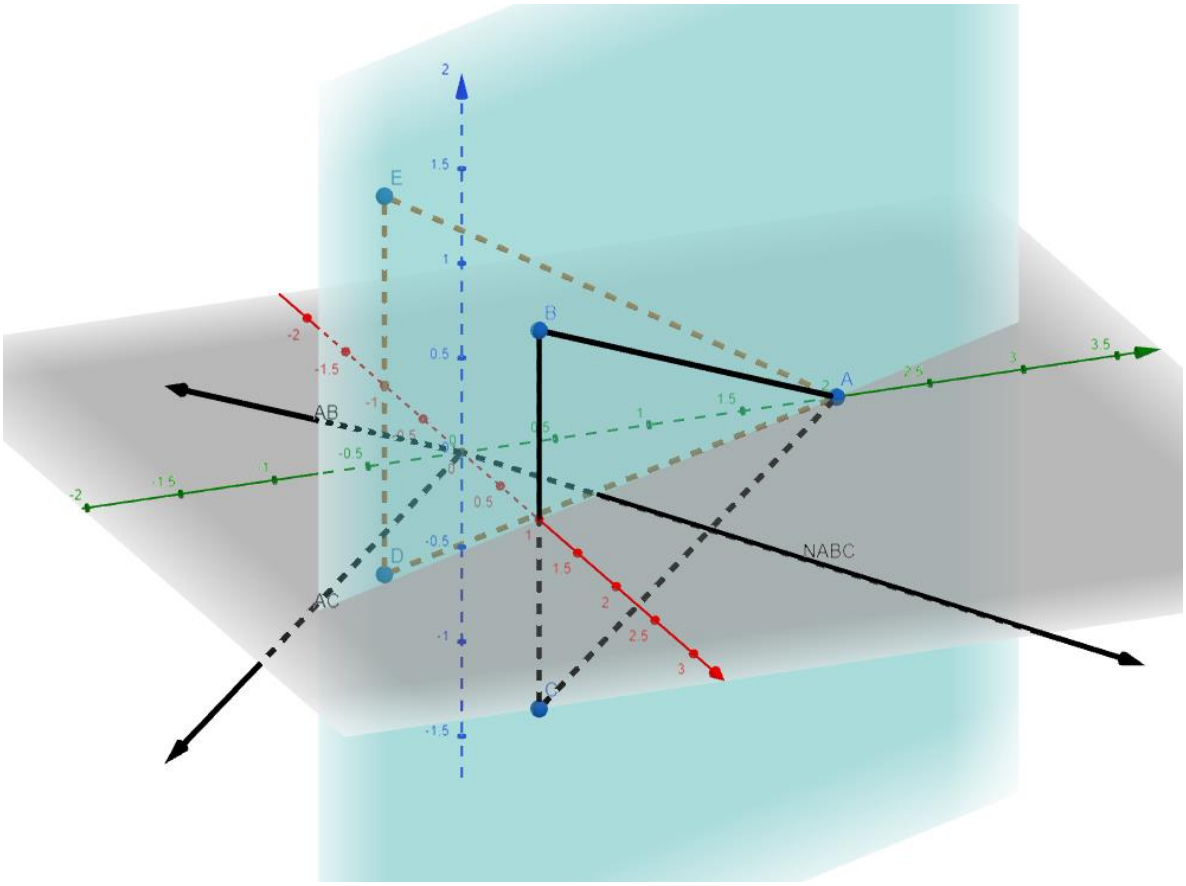
AB, AC, PLANE ABC, Normal ABC



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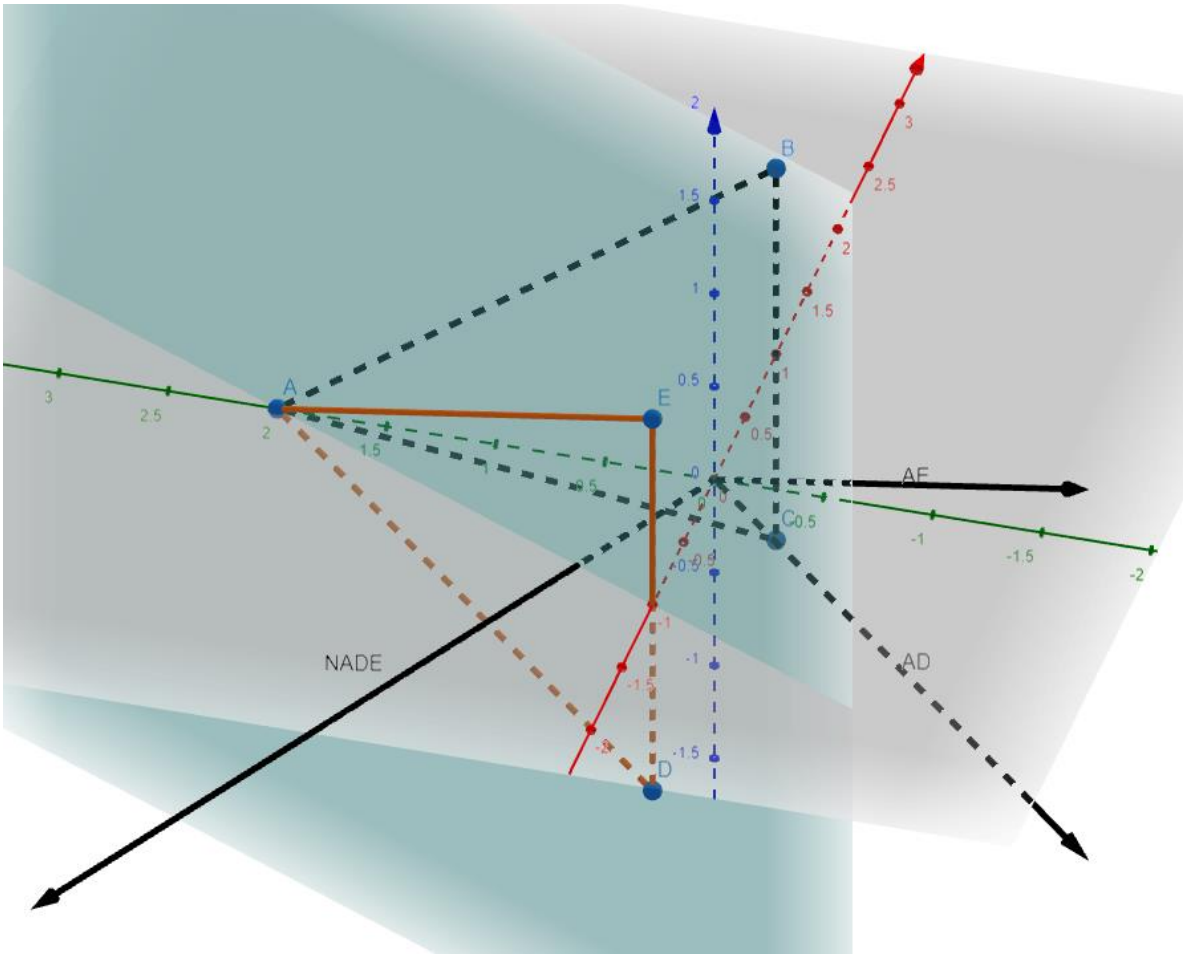
AE, AD, Normal ADE, PLANE ADE



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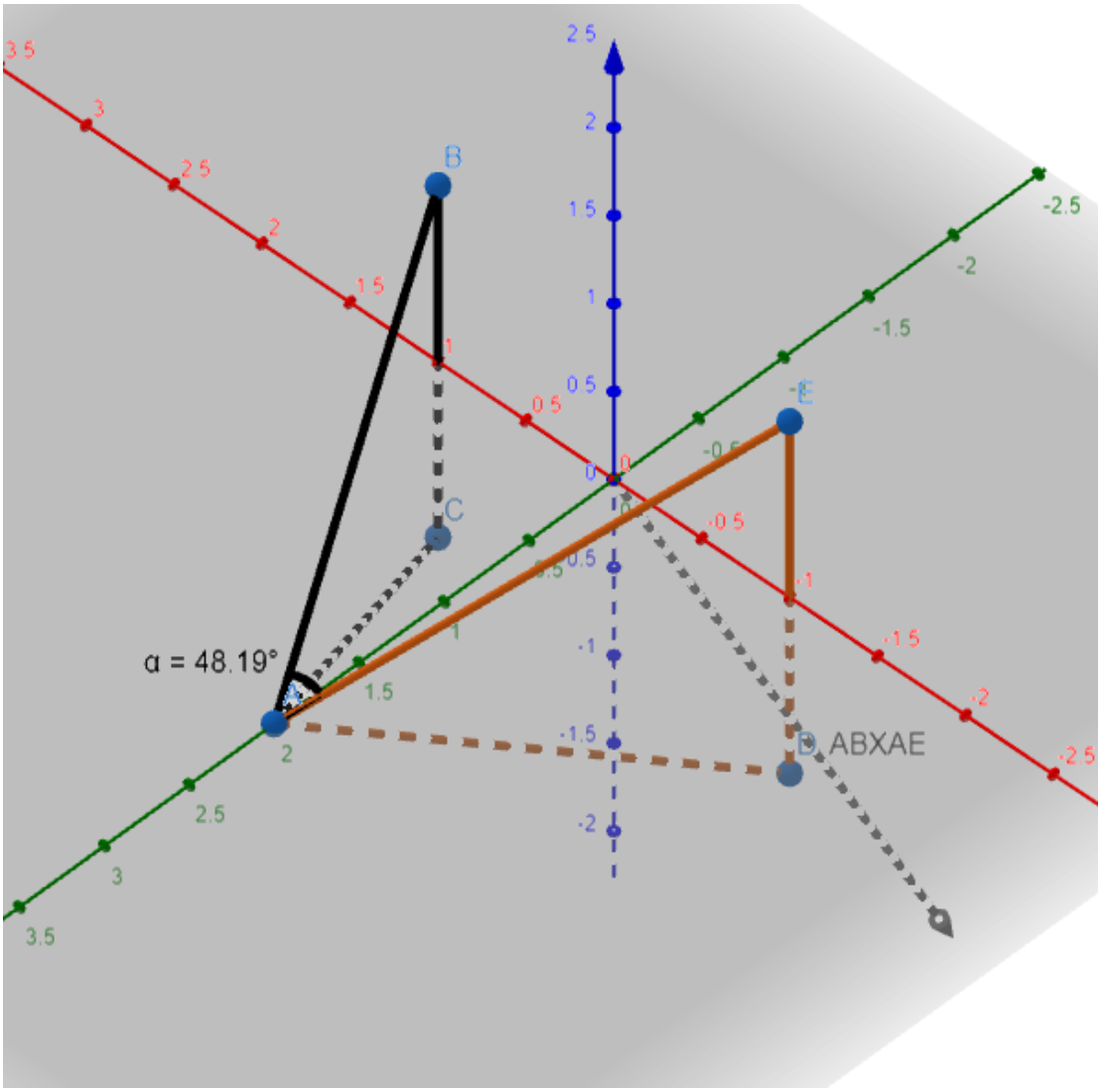
Angle between the 2 triangles , AB x AE



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B, Normal B, Plane NB

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