

Section: 71

Name & Surname: _____

SOLUTION KEY

Math 120 Spring 2017-2018

Quiz no.: 03

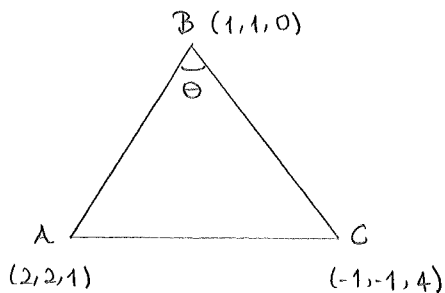
Date: 23.03.18

Time Limit: ~15 Minutes

ID Number: _____

Grade: _____

1. Show that the angle θ at the corner B of the triangle with vertices $A(2, 2, 1)$, $B(1, 1, 0)$, $C(-1, -1, 4)$ is a right angle. (i.e. it is equal to $\frac{\pi}{2}$.)



If $\theta = \frac{\pi}{2}$, $\vec{BA} \cdot \vec{BC} = 0$ since

$$\begin{aligned}\vec{BA} \cdot \vec{BC} &= \|\vec{BA}\| \cdot \|\vec{BC}\| \cdot \cos \theta \\ &= \|\vec{BA}\| \cdot \|\vec{BC}\| \cdot \underbrace{\cos \frac{\pi}{2}}_0 = 0\end{aligned}$$

($\|\vec{BA}\| \neq 0$, $\|\vec{BC}\| \neq 0$)

Write the vectors $\vec{BA} = (2, 2, 1) - (1, 1, 0) = \langle 1, 1, 1 \rangle \neq 0$
 $\vec{BC} = (-1, -1, 4) - (1, 1, 0) = \langle -2, -2, 4 \rangle \neq 0$

$$\begin{aligned}\vec{BA} \cdot \vec{BC} &= \langle 1, 1, 1 \rangle \cdot \langle -2, -2, 4 \rangle = 1 \cdot (-2) + 1 \cdot (-2) + 1 \cdot 4 \\ &= 0\end{aligned}$$

Thus ; $\vec{BA} \perp \vec{BC}$, ie, the angle between \vec{BA} and \vec{BC} θ is $\frac{\pi}{2}$.