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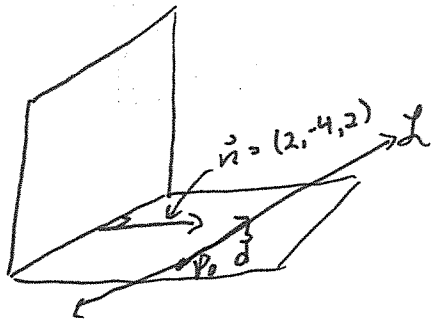
Quiz 9

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. 5.26 (5 marks) Find an equation for the plane that containes the line $x = -1+3t$, $y = 5+2t$, $z = 2-t$ and is orthogonal to the plane $2x-4y+2z = 9$.

$\mathcal{L}$: $(x,y,z) = (-1,5,2) + t(3,2,-1)$



$\therefore$ equation of plane

$(x,y,z) = (-1,5,2) + s(2,-4,2) + t(3,2,-1)$

or $\vec{n}_2 = \vec{n} \times \vec{d} = \left(\begin{vmatrix} -4 & 2 \\ 2 & -1 \end{vmatrix}, -\begin{vmatrix} 2 & 3 \\ 2 & -1 \end{vmatrix}, \begin{vmatrix} 2 & 3 \\ -4 & 2 \end{vmatrix}\right)$

$\begin{matrix} 2 & 3 \\ -4 & 2 \\ 2 & -1 \end{matrix} = (0, 8, 16)$

$8y + 16z = d$

$8(5) + 16(2) = d$

$72 = d$

$\therefore$ $8y + 16z = 72$

$y + 2z = 9$

Question 2. §3.5 #34 *(3 marks)* Prove: If θ is the angle between $\vec{u}$ and $\vec{v}$ and $\vec{u} \cdot \vec{v} \neq 0$, then $\tan\theta = ||\vec{u} \times \vec{v}||/(\vec{u} \cdot \vec{v})$.

$$\frac{\|\vec{u} \times \vec{v}\|}{\vec{u} \cdot \vec{v}} = \frac{\|\vec{u}\|\|\vec{v}\| \sin\theta}{\|\vec{u}\|\|\vec{v}\| \cos\theta} = \frac{\sin\theta}{\cos\theta} = \tan\theta$$

Question 3. §3.5 TF *(2 marks)* Determine whether the statement is true or false, and justify your answer.

The scalar triple product of $\vec{u}$, $\vec{v}$ and $\vec{w}$ determines a vector whose length is equal to the volume of the parallelepided determined by $\vec{u}$, $\vec{v}$, and $\vec{w}$.

False, the scalar triple product is a scalar not a vector.