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MTH 111, Math for the Architects, Spring 2025, 1–1

Quiz 4

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$$Score = \frac{\quad}{20}$$

20/20

QUESTION 1. (6 points)
Find the angle between the vectors $V_1 =< 2, 3 >$ and $V_2 =< -3, 5 >$.

angle = θ

$\theta = \cos^{-1}\left[\frac{V1 \cdot V2}{|V1||V2|}\right]$

$V1 = \langle 2,3 \rangle$

$V2 = \langle -3,5 \rangle$

$V1 \cdot V2 = 2(-3) + 3(5)$
$= 9$

$|V1| = \sqrt{(2)^2+(3)^2} = \sqrt{13}$

$|V2| = \sqrt{(-3)^2+(5)^2} = \sqrt{34}$

$\theta = \cos^{-1}\left[\frac{9}{\sqrt{13}\sqrt{34}}\right]$

$\theta = 64.65°$

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QUESTION 2. (6 points) Let $L_1 : x = 3t + 1, y = 6t - 4, z = 3t + 9$ and $L_2 : x = w - 5, y = 2w + 7, z = w - 3$ be two distinct lines. Is L_1 parallel to L_2? show the work.

$L1 \begin{bmatrix} x = 3t+1 \\ y = 6\cancel{t}t-4 \\ z = 3t+9 \end{bmatrix} t \in R$

$L2 \begin{bmatrix} x = w-5 \\ y = 2w+7 \\ z = w-3 \end{bmatrix} w \in R$

$\rightarrow L1 \parallel L2$?

$D1 = cD2$

$D1 = \langle 3,6,3 \rangle$

$D2 = \langle 1,2,1 \rangle$

$\langle 3,6,3 \rangle = c\langle 1,2,1 \rangle$

$\langle 3,6,3 \rangle = \langle 1c, 2c, 1c \rangle$

$3 = 1c \rightarrow c = 3$

$6 = 2c \rightarrow \frac{\cancel{6}^3}{\cancel{2}_1} \rightarrow c = 3$

$3 = 1c \rightarrow c = 3$

YES! $L1 \parallel L2$

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QUESTION 3. (8 points) Let $L_1 : x = 3t+1, y = 6t-4, z = 3t-1$ and $L_2 : x = 3w-2, y = 2w+2, z = 2w-1$ be two distinct vectors. Does L_1 intersect L_2?

$\begin{bmatrix} x = 3t+1 \\ y = 6t-4 \\ z = 3t-1 \end{bmatrix} t \in R \quad L2 \begin{bmatrix} x = 3w-2 \\ y = 2w+2 \\ z = 2w-1 \end{bmatrix} w \in R$

DOES L1 intersect L2 ?

$xL1 = xL2$

$yL1 = yL2$

$3t+1 = 3w-2$

$3t-3w = -2-1$

$\boxed{3t-3w = -3} \rightarrow$ 1

$6t-4 = 2w+2$

$6t-2w = 2+4$

$\boxed{6t-2w = 6} \rightarrow$ 2

$t = 2$

$w = 3$

z in L1 = z in L2

$z = 3t-1$

$t = 2$

$zL1 = 3(2)-1$

$\boxed{zL1 = 5}$

$z = 2w-1$

$w = 3$

$zL2 = 2(3)-1$

$\boxed{zL2 = 5}$

YES! L1 intersects L2 since z in L1 = z in L2

L1 point of intersection = (7,8,5)

L2 point of intersection = (7,8,5)

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Faculty information

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