Dawson College: Linear Algebra (SCIENCE): 201-NYC-05-S4: Fall 2014

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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.

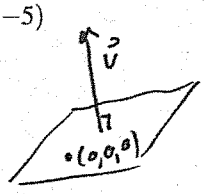
Question 1. *(1 mark)* §3.4 #1 Find the parametric equation of the line containing the point and parallel to the vector. Point: $(-4,1)$; vector: $\vec{v} = (0,-8)$.

$X = P_0 + t\vec{v} = (-4,1) + t(0,-8) \quad , \ t \in \mathbb{R}$

Question 2. *(1 mark)* §3.4 #9 Find the parametric equation of the plane containing the point and parallel to the vector. Point: $(-3,1,0)$; vector: $\vec{v}_1 = (0,-3,6)$ and $\vec{v}_2 = (-5,1,2)$.

$X = P_0 + s\vec{v}_1 + t\vec{v}_2 = (-3,1,0) + s(0,-3,6) + t(-5,1,2) \qquad s,t \in \mathbb{R}$

Question 3. *(3 marks)* §3.4 #9 Find the parametric equations of the plane in R^3 that passes through the origin and is orthogonal to $\vec{v} = (4,0,-5)$



$ax + by + cz = d$
$4x - 5z = d$
$4(0) - 5(0) = d$
$0 = d$
$\therefore 4x - 5z = 0$

Let $y = s$, $z = t$ then $x = \frac{5}{4}t$

$X = (x,y,z)$
$= t(\frac{5}{4},0,1) + s(0,1,0)$

Question 4. §3.4 #23

a. *(1 mark)* Find a homogeneous linear system of two equations in three unknowns whose solution space consistes of those vectors in R^3 that are orthogonal to $\vec{a} = (1,1,1)$ and $\vec{b} = (-2,3,0)$.

b. *(2 marks)* What kind of geometric object is the solution space?

c. *(2 marks)* Find a general solution of the system obtained in part a.

a) $x + y + z = 0$
$-2x + 3y = 0$

c) $\left[\begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ -2 & 3 & 0 & 0 \end{array}\right]$

$\sim_{2R_1+R_2 \to R_2} \left[\begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 0 & 5 & 2 & 0 \end{array}\right]$

$\sim_{\frac{1}{5}R_2 \to R_2} \left[\begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 0 & 1 & 2/5 & 0 \end{array}\right]$

$\sim_{-R_2+R_1 \to R_1} \left[\begin{array}{ccc|c} 1 & 0 & 3/5 & 0 \\ 0 & 1 & 2/5 & 0 \end{array}\right]$

Let $z = t$

$x = -\frac{3}{5}t$
$y = -\frac{2}{5}t$

$X = (x,y,z)$
$= (-\frac{3}{5}t, -\frac{2}{5}t, t)$
$= t(-\frac{3}{5}, -\frac{2}{5}, 1)$

b) a line passing through the origin: