Dawson College: Linear Algebra: 201-105-05-S3: Fall 2012

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Quiz 11

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. §3.3 #40 *(5 marks)* Find the distance between the given parallel planes.

P_1: $2x-y+z=1$ and $2x-y+z=-1$ P_2

Lets find a point on P_1, let $x=y=0$, $z=1$
$\therefore P(0,0,1)$

Lets find a point on P_2, let $x=y=0$, $z=-1$
$\therefore Q(0,0,-1)$

$\vec{QP} = P-Q = (0,0,1)-(0,0,-1) = (0,0,2)$

$d = \|\text{proj}_{\vec{n}} \vec{QP}\| = \left\| \frac{(0,0,2)\cdot(2,-1,1)}{(2,-1,1)\cdot(2,-1,1)} (2,-1,1) \right\|$

$= \left\| \frac{2}{4+1+1} (2,-1,1) \right\|$

$= \left\| \frac{1}{3} (2,-1,1) \right\|$

$= \sqrt{\left(\frac{2}{3}\right)^2 + \left(\frac{-1}{3}\right)^2 + \left(\frac{1}{3}\right)^2} = \sqrt{\frac{4}{3^2} + \frac{1}{3^2} + \frac{1}{3^2}}$

$= \sqrt{\frac{6}{3^2}} = \sqrt{\frac{2}{3}}$

Question 2. YP pg.1 #7 *(5 marks)* Find the point on the line $x=6+t$, $y=2+t$, $z=3+t$ where $t \in \mathbb{R}$ which is the closest to the point $A(0,1,1)$

$\vec{P_0P} = \text{proj}_{\vec{d}} \vec{P_0A}$

$P - P_0 = \text{proj}_{\vec{d}} \vec{P_0A}$

$P = \text{proj}_{\vec{d}} \vec{P_0A} + P_0$

$\vec{P_0A} = A - P_0$
$= (0,1,1) - (6,2,3)$
$= (-6,-1,-2)$

$= \frac{\vec{P_0A}\cdot\vec{d}}{\vec{d}\cdot\vec{d}} \vec{d} + P_0$

$= \frac{(-6,-1,-2)\cdot(1,1,1)}{(1,1,1)\cdot(1,1,1)} (1,1,1) + (6,2,3)$

$= \frac{-9}{3} (1,1,1) + (6,2,3)$

$= (-3,-3,-3) + (6,2,3) = (3,-1,0)$

$\therefore P(3,-1,0)$