

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 $x=y=0, z=-1$
 $\therefore Q(0,0,-1)$

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

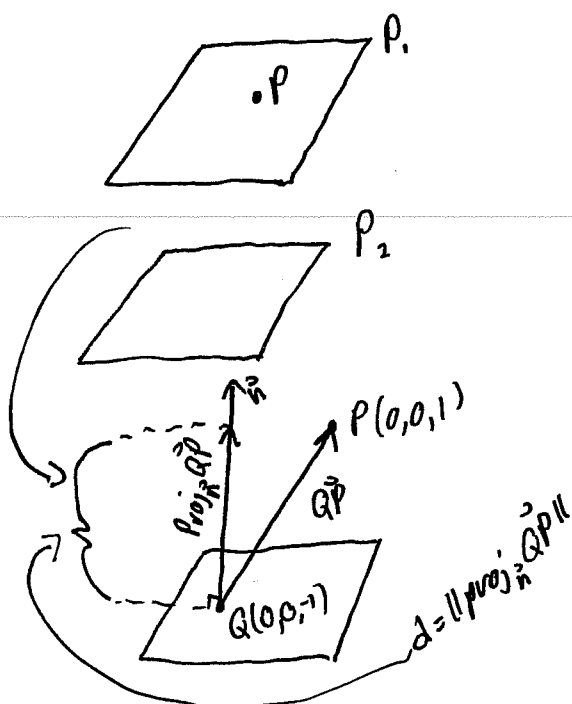
$d = \|\text{proj}_{\vec{n}} \vec{QP}\| = \left\| \frac{(0,0,2) \cdot (2,-1,1)}{(2,-1,1) \cdot (2,-1,1)} (2,-1,1) \right\|$

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

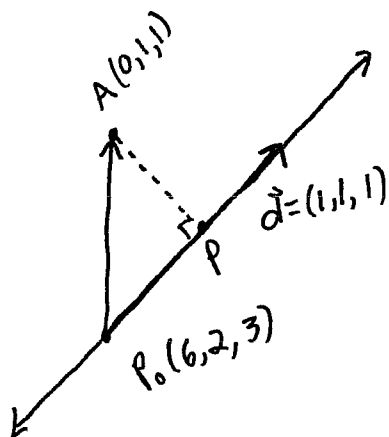
$= \left\| \frac{1}{3} (2,-1,1) \right\|$

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

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



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 $A(0,1,1)$



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

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

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

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

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

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

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

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

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