Advanced Higher Maths
SQA 2018 Paper
Question 16

Planes π_1, π_2 and π_3 have equations:

$$\begin{aligned} \pi_1 &: \quad x - 2y + z = -4 \\ \pi_2 &: \quad 3x - 5y - 2z = 1 \\ \pi_3 &: \quad -7x + 11y + az = -11 \end{aligned}$$

where $a \in \mathbb{R}$.

(a) Use Gaussian elimination to find the value of a such that the intersection of the planes π_1, π_2 and π_3 is a line. **4**

(b) Find the equation of the line of intersection of the planes when a takes this value. **2**

The plane π_4 has equation $-9x + 15y + 6z = 20$.

(c) Find the acute angle between π_1 and π_4. **3**

(d) Describe the geometrical relationship between π_2 and π_4.
Justify your answer. **1**

Answers:

(a) $a = 8$

(b) $x = 22 + 9t,\ y = 13 + 5t,\ z = t$

(c) 0·75

(d) Planes π_2 and π_4 are parallel because the normal of π_4 is a multiple of the normal of π_2.