

Question 3

b (i)

Find a point in plane  $2x - 3y + 6z = 1$

Let  $z = 0$  and  $y = 1$  then

$$2x - 3y = 1$$

$$\therefore x = 2$$

$(2, 1, 0)$  is a point on the plane  $2x - 3y + 6z = 1$

Form a vector from this point  $A(2, 1, 0)$  to point  $B(1, -4, -3)$

Let

$$\vec{v} = (1, -4, -3) - (2, 1, 0) = (-1, -5, -3)$$

The normal vector of plane  $2x - 3y + 6z = 1$  is :

$$\vec{n} = (2, -3, 6)$$

The distance between the plane and point is:

Distance

$$= |\vec{v}| \cos \theta$$

$$= \left| |\vec{v}| \frac{\vec{v} \cdot \vec{n}}{|\vec{v}| |\vec{n}|} \right|$$

$$= \frac{|\vec{v} \cdot \vec{n}|}{|\vec{n}|}$$

$$= \frac{|(-1, -5, -3) \cdot (2, -3, 6)|}{\sqrt{2^2 + 3^2 + 6^2}}$$

$$= \frac{|-5|}{\sqrt{49}} = \frac{5}{7}$$

Alternate solution Use the formula