

## ▼ question 2



Part 2

$$\underline{1} \quad q_1 + q_2$$

$$= (1+2) + 2i + (2+3)j + k$$

$$= 3 + 2i + 5j + k$$

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$$q_1 q_2$$

$$= (1+2i+2j)(2+3j+k)$$

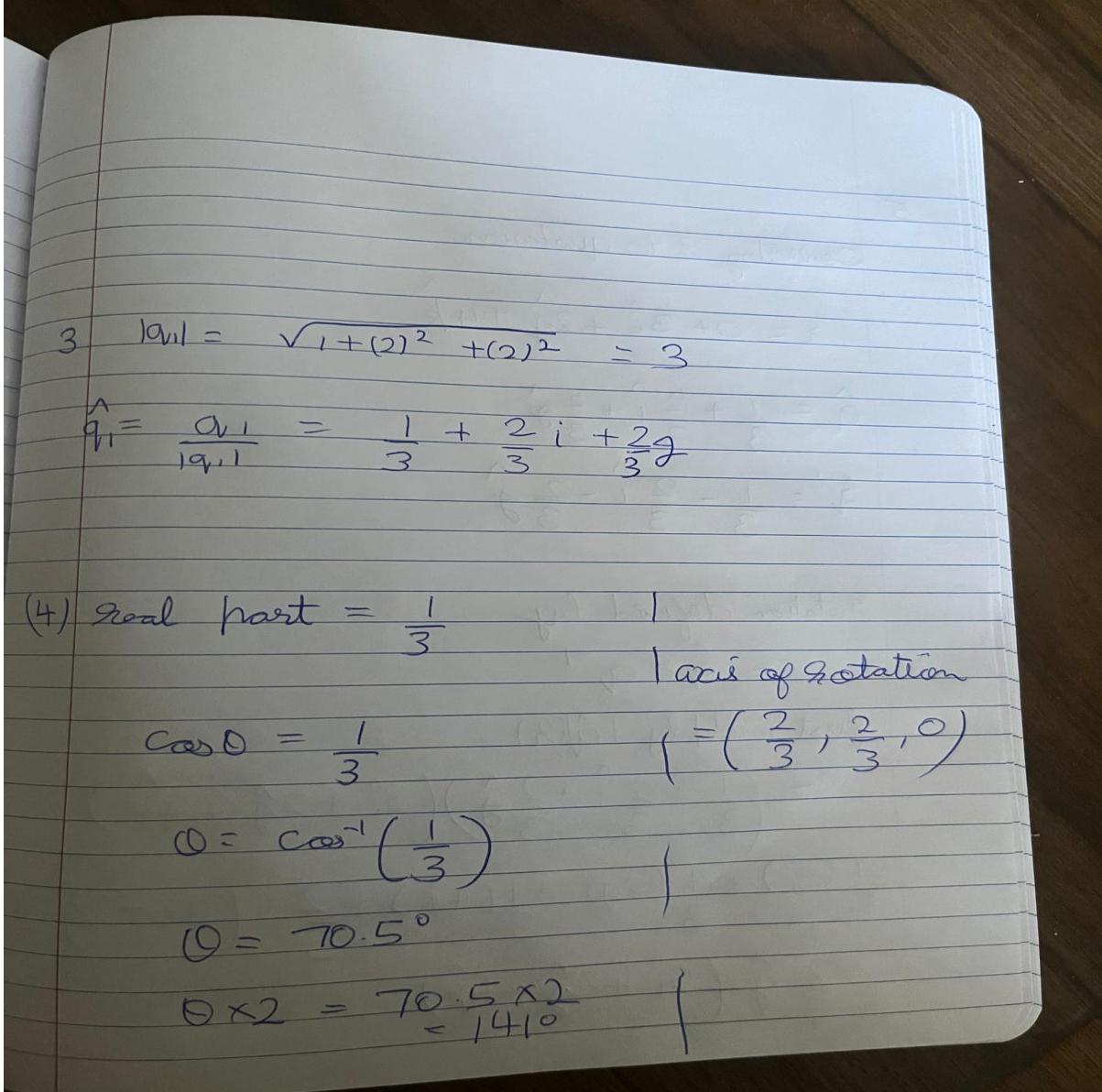
$$= (2+3j+k) + 2i(2+3j+k) + k(2+3j+k)$$

$$= 2 + 3j + k + 4i + 6j + 2k + 2kj + 3i - 1$$

$$= -4 + 6i + 5j + 7k$$



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Question 2 , Part 5

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Converting  $\vec{r}$  to quaternion

$$\vec{r} = 0 + 3\hat{i} + 2\hat{j} + 4\hat{k}$$

$$\hat{q} = \frac{1}{3} + \frac{2}{3}\hat{i} + \frac{2}{3}\hat{j}$$

$$\hat{q}^{-1} = \frac{1}{3} - \frac{2}{3}\hat{i} - \frac{2}{3}\hat{j}$$

Rotation defined by

$$= \hat{q} \vec{r} \hat{q}^{-1}$$

first multiply  $\hat{q}(\vec{r})$

$$= \left( \frac{1}{3} + \frac{2}{3}\hat{i} + \frac{2}{3}\hat{j} \right) (3\hat{i} + 2\hat{j} + 4\hat{k})$$

$$= \frac{1}{3}(3\hat{i}) + \frac{1}{3}(2\hat{j}) + \frac{1}{3}(4\hat{k}) + \frac{2}{3}\hat{i}(3\hat{i} + 2\hat{j} + 4\hat{k})$$

$$= \frac{2}{3}\hat{j}(3\hat{i} + 2\hat{j} + 4\hat{k})$$