Various Sneaky Mathematicians 2

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Question 3

You have a dodgy enchanted portal that can take you to the point $(3, 5, -7)$. Right when you step out of the portal you find your hoverboard and magic carpet. Your hoverboard travels along $\begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}$ and your magic carpet along $\begin{bmatrix} 3 \\ 1 \\ 1 \end{bmatrix}$.

1. Sunzi has hidden at the point $(36, 36, 0)$. Can you reach him? If yes, then how long do you need on each mode of transport? If no, then show why this is not possible.

2. Where can Sunzi hide so you cannot find him?

Question 4

Bhāskara II is also in $\mathbb{R}^3$ and is hidden at a point satisfying the equation $3x + 2y - z = 4$. You have a new hoverboard and magic carpet ready to be programmed (and again you can only program each once). You also have a single use portal available to jump anywhere in $\mathbb{R}^3$.

1. How should you program your hoverboard and magic carpet and how should you use your portal to ensure you can find Bhāskara? (Note: remember we are now in $\mathbb{R}^3$ so you will need to specify 3-dimensions for travel points.)

2. Ask your instructor to learn the exact point (x, y, z) where Bhāskara is hiding. Based on the point and direction you chose in (1), when will you reach Bhāskara?

Question 5

Maryam Mirzakhani is standing on yet another plane in $\mathbb{R}^3$. She tells us she is perpendicular to the plane with her feet at the point $(26, 22, 12)$ and the tip of her head at $(29, 30, 7)$.

1. Where can Mirzakhani walk around?