13) Hi this is Swapnila! I am a Student Success Coach and will be explaining some practice problems from the MA005 Calculus course. Today we will review an assigned problem from Unit 1. In the “Homework Assessment” you were asked to solve this problem:

The lines \( y = x \) and \( y = 4 - x \) intersect at point \((2, 2)\).

a) Use the slopes to show that the lines are perpendicular.

b) Graph them together on your calculator using the “window” \(-10 \leq x \leq 10, -10 \leq y \leq 10\). Why do the lines not appear to be perpendicular on the calculator display?

c) Find a suitable window for the graphs so the lines so that they do appear perpendicular.

a)

Approach to this part will be as follows:

1. Find the slopes of both lines.
2. If product of slopes of two lines is equal to \(-1\), then the lines are perpendicular to each other.

**Step 1:**

The equation of the first line is \( y = x \).

Comparing this with standard equation of line, \( y = mx + b \), slope \( m_1 = 1 \).

The equation of the second line is \( y = 4 - x \). This can be written as \( y = -x + 4 \).

Comparing this with the standard equation of line, \( y = mx + b \), slope \( m_2 = -1 \).

**Step 2:**

Product of these two slopes = \( m_1 * m_2 = 1 * -1 = -1 \)

**Conclusion:**

Lines \( y = x \) and \( y = 4 - x \) are perpendicular to each other since the product of the slopes of these two lines is \(-1\).
Approach to this part will be as follows:

1. Graph both lines on the same screen of the calculator using the given range of x and y values.
2. Observe the graph carefully, and comment on the question.

**Step 1:**

Graphing both lines on the same screen of the calculator, it appears as below:

![Graph of lines](image)

**Step 2:**

Range of x values $10 - (-10) = 20$, and range of y values $10 - (-10) = 20$. The x axis looks wider than y axis though the range is the same. So the lines do not appear perpendicular on the calculator display.

**Conclusion:**

Due to the appearance of wider x axis than y axis, the lines do not appear perpendicular on the calculator display.

c)  

Approach to this part will be as follows:
1. From part b, range of x axis is wider. So make the changes in x maximum and x minimum so that the graphs appear perpendicular.

2. From step 1, find the relation between the range of x axis and range of y axis.

**Step 1:**

The two lines appear perpendicular when the x minimum is -17 and x maximum is 17 by keeping the y range the same as given in part b.

The graph is as below:

![Graph](image)

**Step 2:**

Now the range of x axis = 17 – (−17) = 34, and range of y axis = 10 – (−10) = 20.

\[
\frac{34}{20} = 1.7
\]

So we need to set the window (x max. − x min.) = 1.7 (y max. − y min.)

**Conclusion:**
We need to set the window \((x_{\text{max.}} - x_{\text{min.}}) = 1.7\) \((y_{\text{max.}} - y_{\text{min.}})\) so that both the lines appear perpendicular.

Please let me know if you have any question on this problem, or on this topic generally. I will be here in the forum for the next hour.