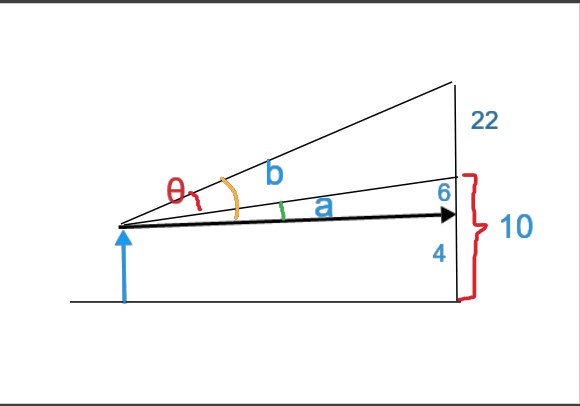
**Question 1**

1(a)



As shown in the picture, = b-a

∵ a=

b=

∴ - (proven)

1(b)

from 1(a), -

∴ tan - )

=

=

, a and b are all within the first and second quadrant

are positive because x>0

∴a>0,b>0

∴ , a and b are all in the first quadrant

∵b>a

∴ b-a is also in the first quadrant,= is true

∵ >0

∴ >0 (x is positive)

∴ (Proven)

1(c)

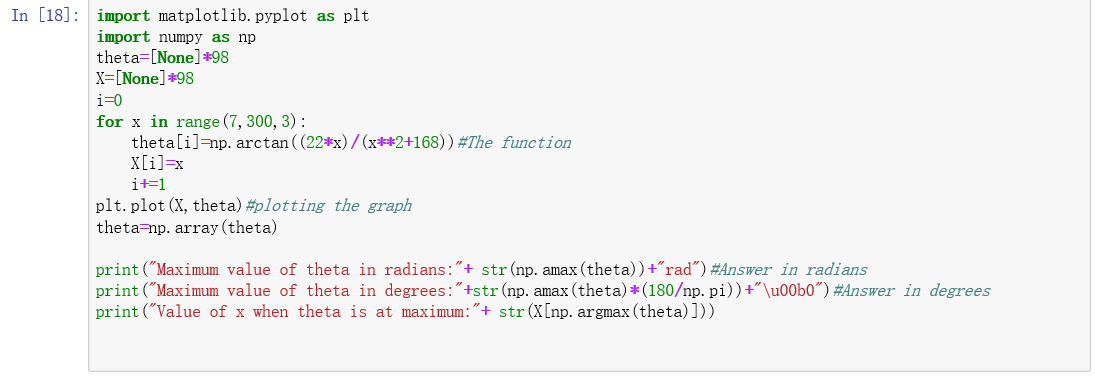
By using calculator, substitute 7, 10,13,16,19 respectively into the equation

The values of , rounded to 4 decimal places, are 35.3625 **°,39.3824 °, 40.3201 °, 39.6991 °, 38.3147 ° respectively.**

**We noticed that the value of** reaches maximum when the value of is 13.After that, the value of decreases while increases.

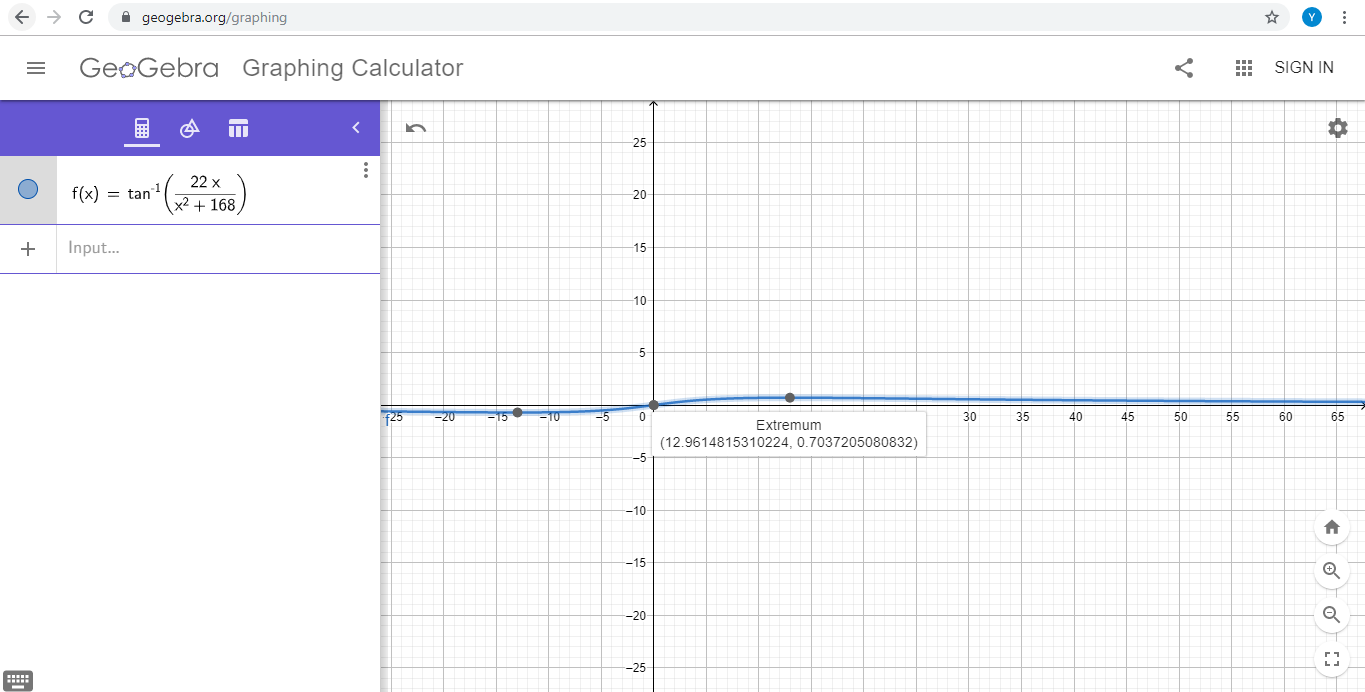
**Using Python and Geogebra as an approach to solve Question 1(c)**

Using the programming language Python, we can plot a graph to find out the maximum value of.

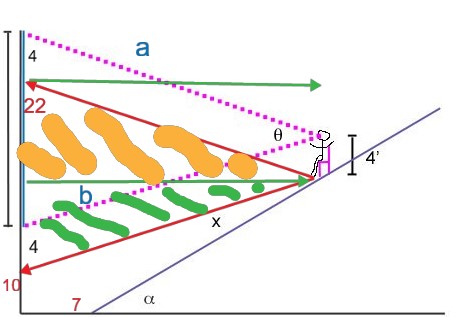
The code:

Output:

Also, we plotted a graph with Geogebra, a simple-to-use online math tool to find the maximum value of theta. The value of x (rounded from 12.9614815310224) is 13. Therefore, the person should sit on the third row to get the maximum view.



**Question 2**



=25°

2(a)

As shown in the picture above, 2 red lines parallel to a and b are drawn. The green lines are parallel to the horizontal.

The red line parallel to a has the same length with a because it forms a parallelogram with the screen, the person, a and itself.

=cos

Horizontal distance of the person from the bottom of the incline =xcos

=sin

Vertical distance of the person from the bottom of the incline =xsin

Therefore, in the right-angled triangle shaded with yellow,

[The length of the green line squared)[The length of the screen in the right-angled triangle squared]

(Pythagorean Theorem)

For the same reason, in the right-angled triangle shaded with green,

= [The length of the green line squared] [The length of the screen in the right-angled triangle squared]

Applying cosine rule,=

∴=

()

2(b)

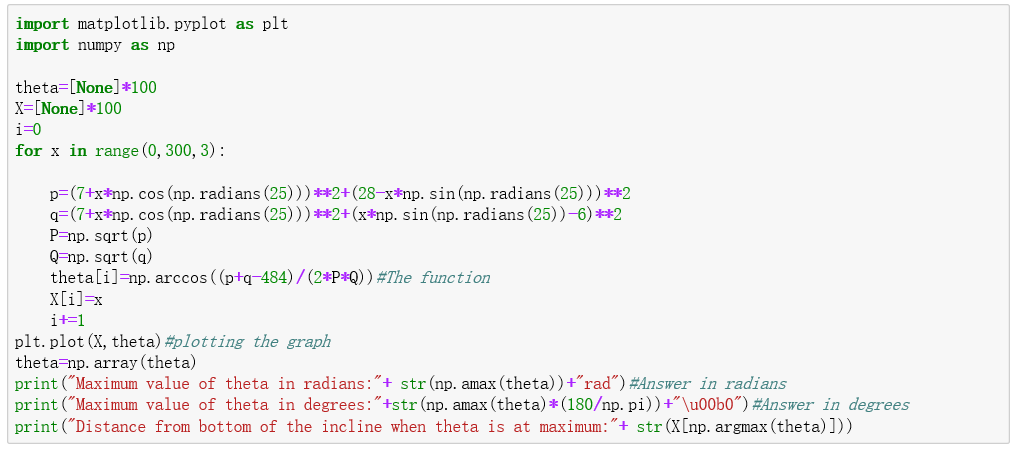
By using calculator, substitute 0, 3, 6, 9, 12 respectively into the equation

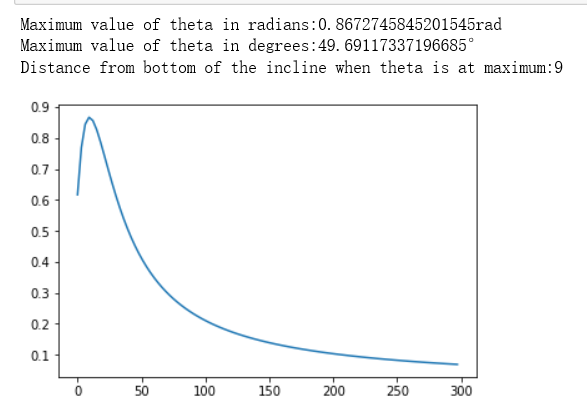
**,** where

=

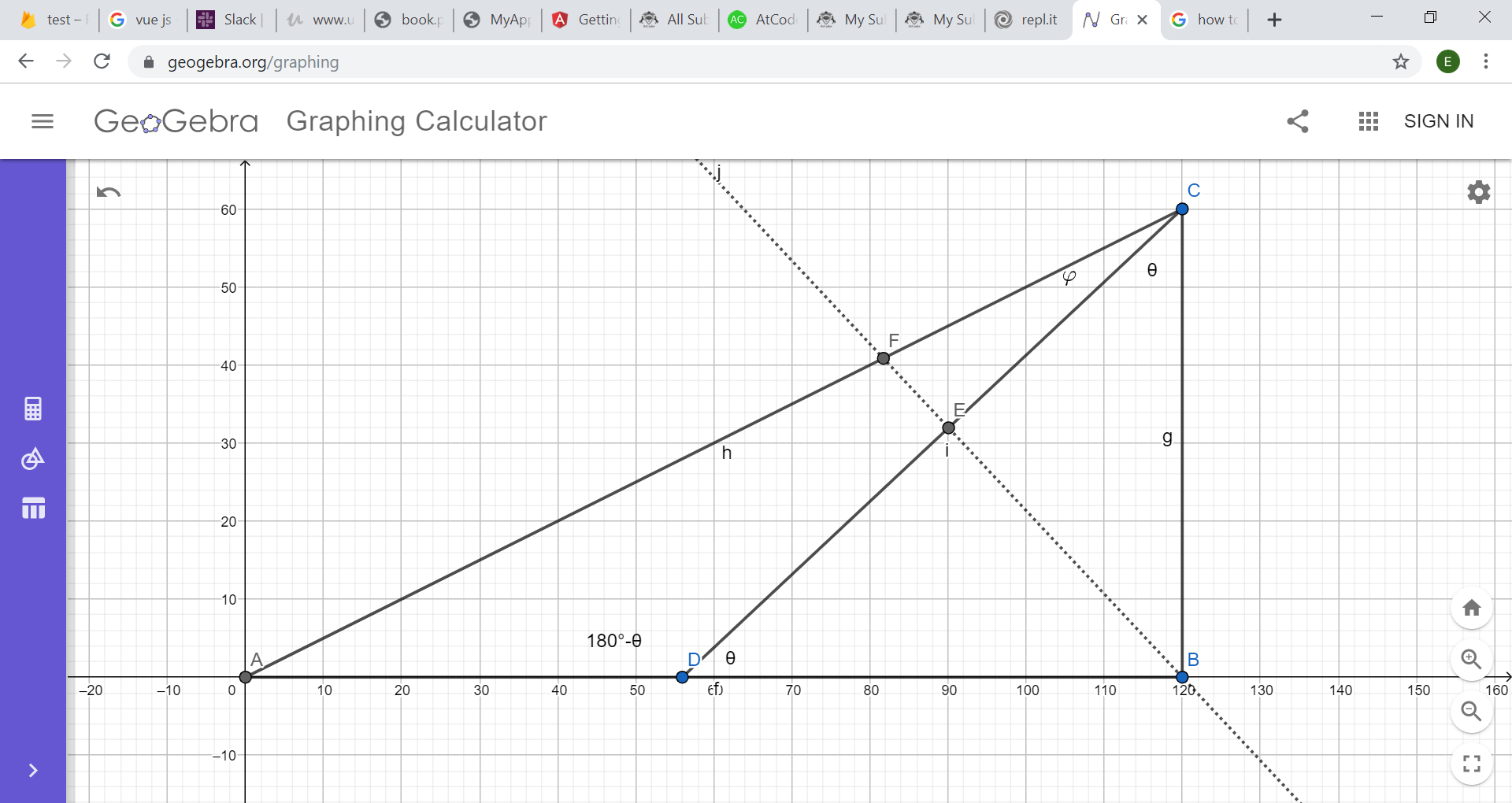
The values of , rounded to 4 decimal places, are 35.3625 **°**, 44.0590 **°**, 48.4031 **°**, 49.6912 **°**, 49.0855 **°. We noticed that the value of** reaches maximum when the value of is 9.After that, the value of decreases while increases.

To understand more about the relationship of x with we plot the graph of against x in Python.

The code:

Output: 

As shown in the graph, the person should sit in the fourth row (9 ft away from the bottom of the incline) in order to get the maximum view.



**Question()**

Prove: tanθ =3tan

Method 1:

In triangle CDB, =

DC=2cos θ

Construct a line BF perpendicular to line CD, thus CE=cos θ=,

By Menelaus Theorem, x x = 1

In triangle CEF,

By sine rule, =

= (1)

In triangle CAD,

By sine rule, =

= AC (2)

, tanθ =3tan. (Proved)

Method 2:

In triangle ABC,

=

tanθ =3tan. (Proved)

**Question 11**

If tan A= , prove that tan (B-A) = .

Solution:

L.H.S. = tan (B-A)

=

=

=

=

=

=

= R.H.S. (proven)