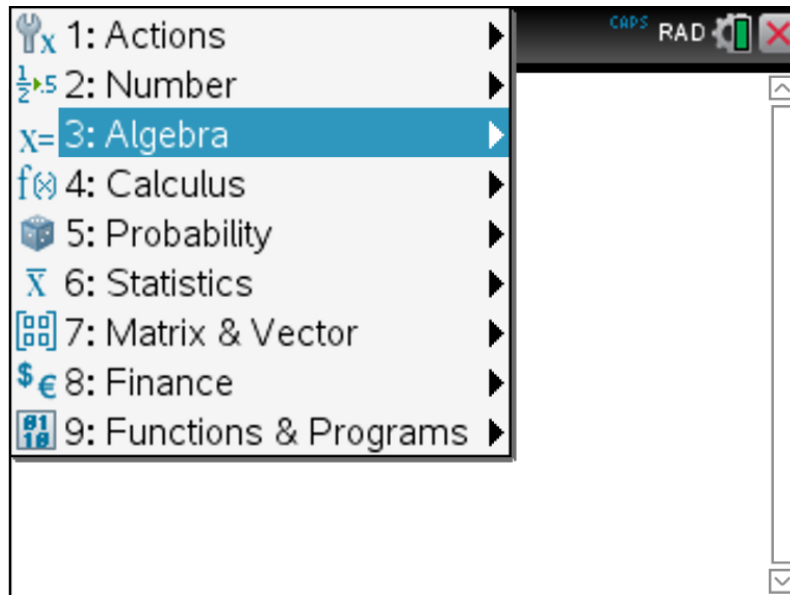


Exam Style Question 1 – Mathematics SL

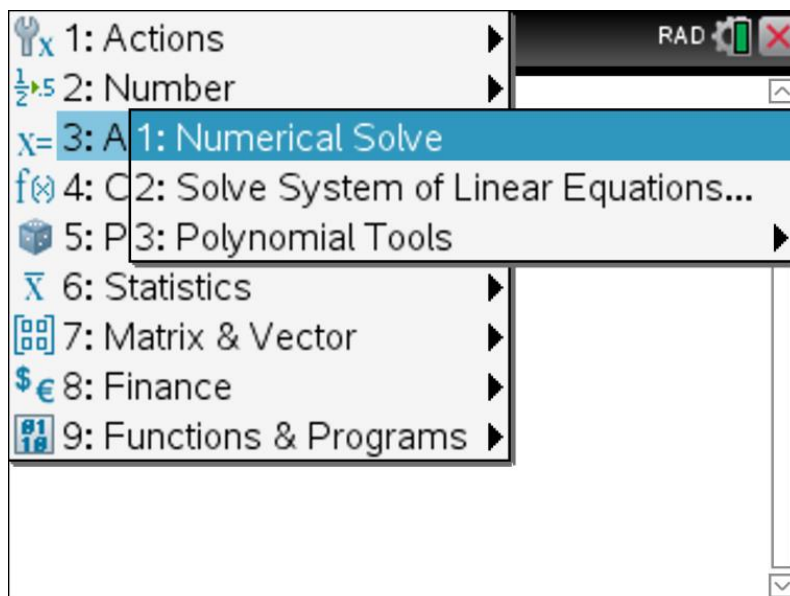
Let $f(x)=x^2+2x+1$ and $g(x)=x-5$ for all real x .

Solve $(f \circ g)(x)=0$.

To solve this problem, open a Calculator document then press **Menu**, choose **Algebra**:



then choose **Numerical Solve**:



The following function will appear. Enter your function into the brackets followed by a comma and then the variable you want to solve for: x.

$$\text{nSolve}\left((x-5)^2+2\cdot(x-5)+1=0,x\right)$$

Then press **Enter** to get your solution.

$\text{nSolve}\left((x-5)^2+2\cdot(x-5)+1=0,x\right)$

4.

To see if there are any other solutions, press **CTRL** then = to get the following options in the grid. Choose the vertical line: |

$$\text{nSolve}\left((x-5)^2+2\cdot(x-5)+1=0,x\right)$$

>	<	≠
≥	≤	

Then type x, press **CTRL** then = again and choose the not equal to sign.

$$\text{nSolve}\left((x-5)^2+2\cdot(x-5)+1=0,x\right)|x$$

>	<	≠
≥	≤	

Then press 4:

$$\text{nSolve}\left((x-5)^2+2\cdot(x-5)+1=0,x\right)|x\neq 4$$

Then press **Enter**.

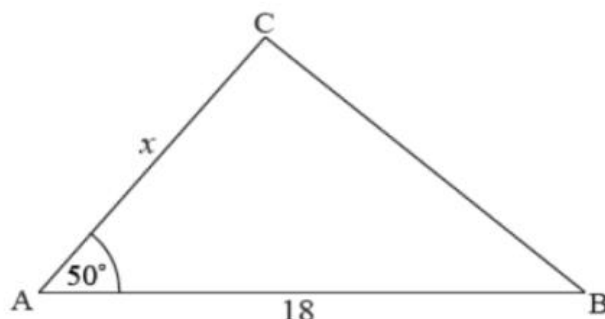
$$\text{nSolve}\left((x-5)^2+2\cdot(x-5)+1=0,x\right)|x\neq 4 \quad 4.$$

|

Since only 4 comes up as the answer, this is the only solution.

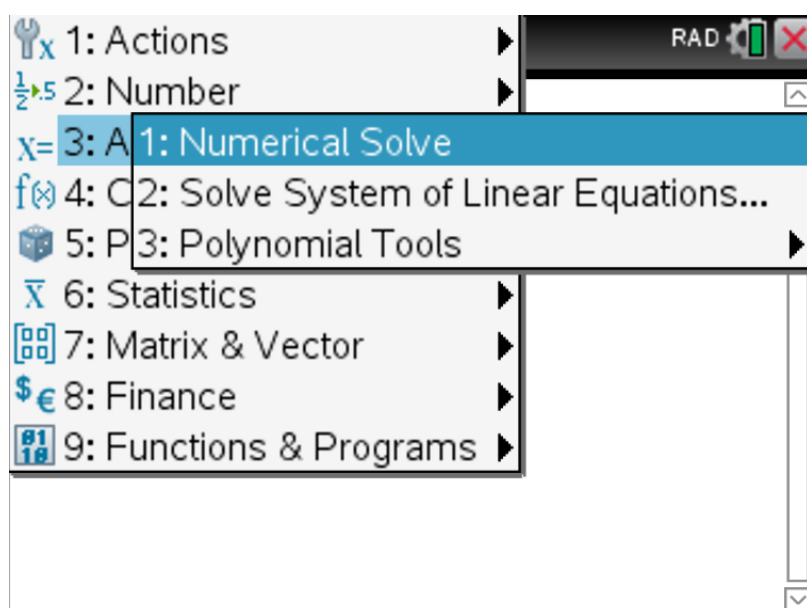
Exam Style Question 2 – Mathematics SL

Consider the following diagram:



The area of the triangle is 80 cm^2 . Find x .

To solve this problem, open a Calculator document then press **Menu**, choose **Algebra** then choose **Numerical Solve**:



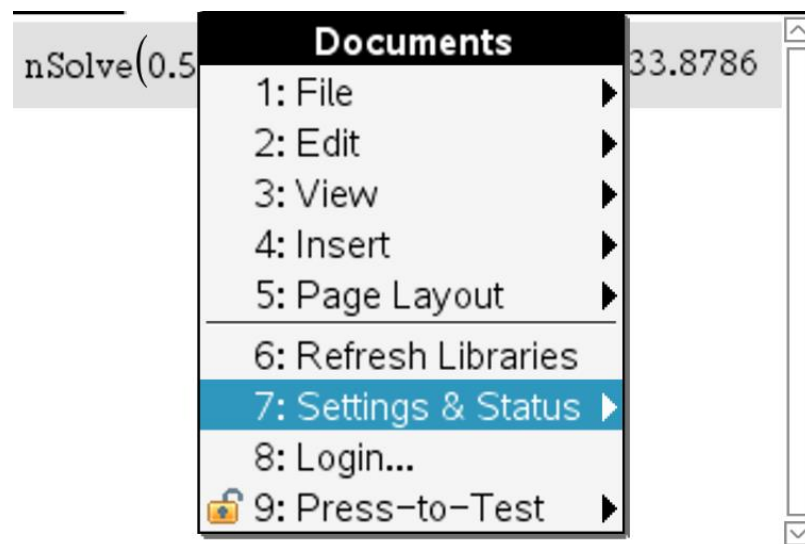
Use the Trigonometric Area rule to create an equation involving x . Enter this into the brackets of the nSolve function followed by a comma and then x :

$$\text{nSolve}(0.5 \cdot x \cdot 18 \sin(50) = 80, x)$$

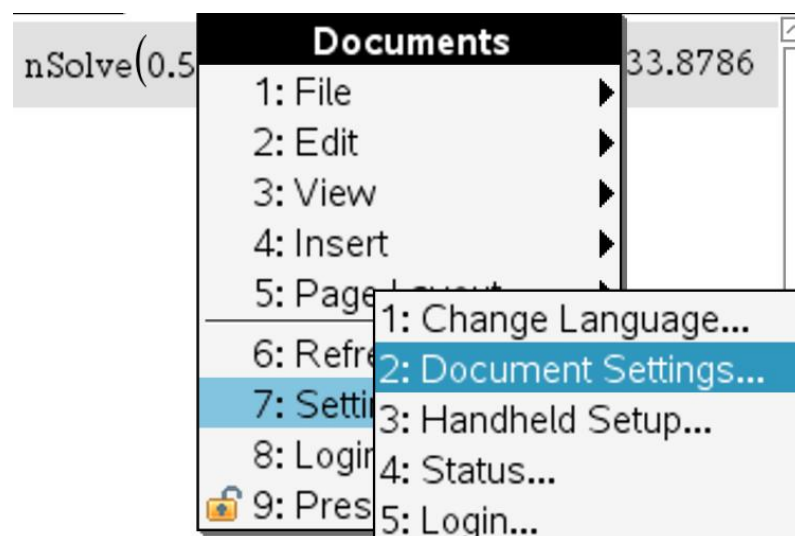
Press **Enter**:

$$\text{nSolve}(0.5 \cdot x \cdot 18 \cdot \sin(50) = 80, x) \quad -33.8786$$

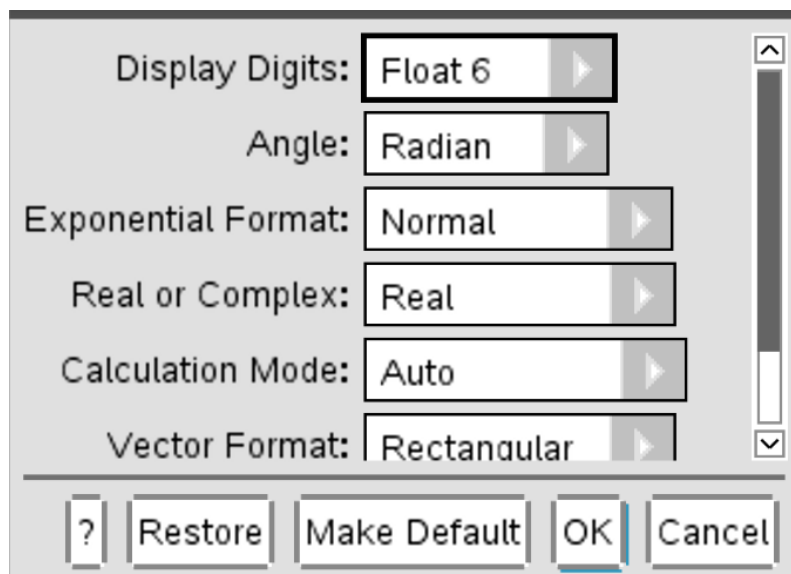
We get a negative answer, which indicates that we may be in the wrong mode. To check the settings, press the **doc** button:



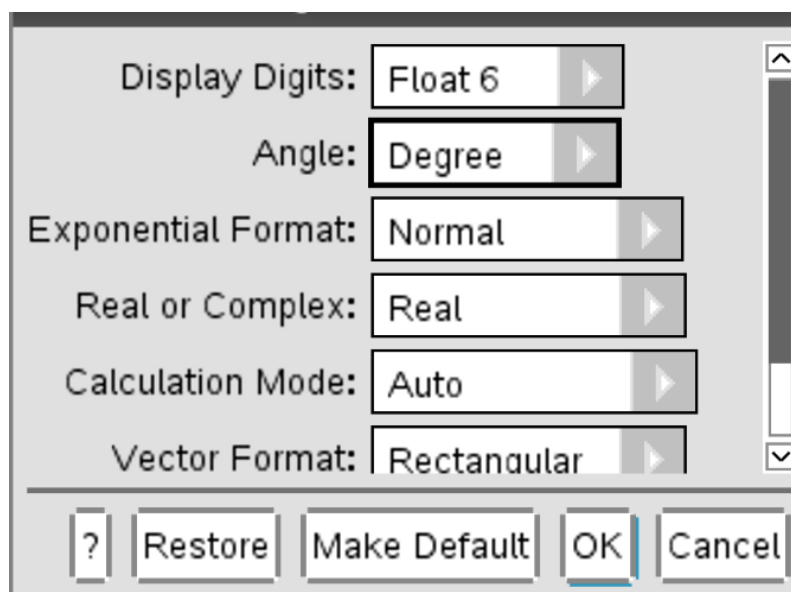
Choose **Settings and Status** then **Document Settings**:



We can see that the settings is in Radian:



Click on the Angle setting and choose **Degree**:



Then press **OK** and press **Enter** to get your correct answer for x:

$$\text{nSolve}(0.5 \cdot x \cdot 18 \cdot \sin(50) = 80, x) \quad 11.6036$$

Exam Style Question 3 – Mathematics SL

Consider $f(x)=2-x^2$ and $g(x)=\sin e^x$ for $-2 \leq x \leq 2$.

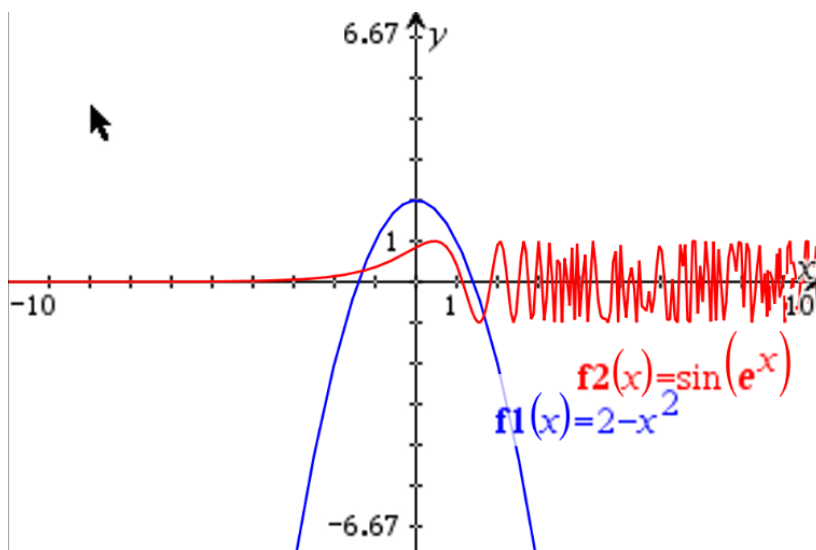
a) Solve $f(x)=g(x)$.

b) Write down the set of values for x such that $f(x) > g(x)$.

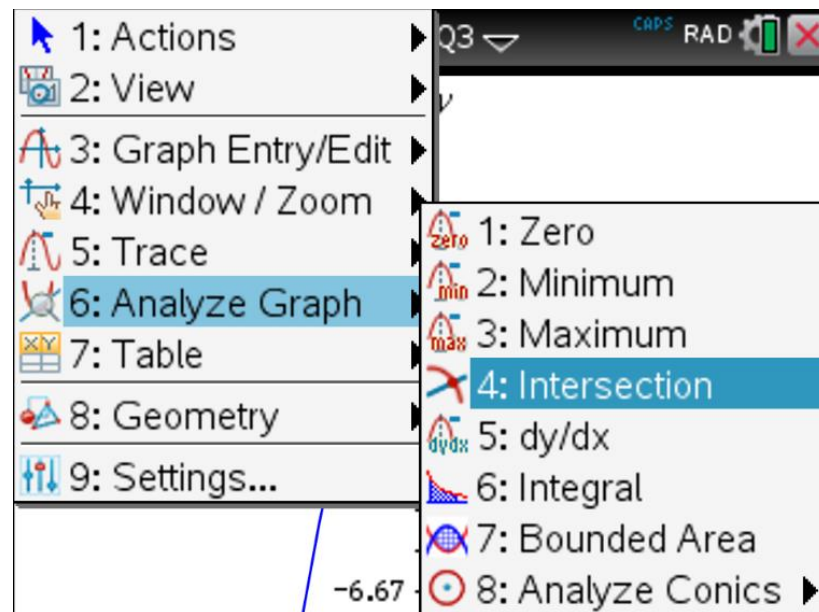
Once again we can use Numerical Solve to solve the equation:

$$\text{nSolve}(2-x^2=\sin(e^x), x) \quad -1.31732$$

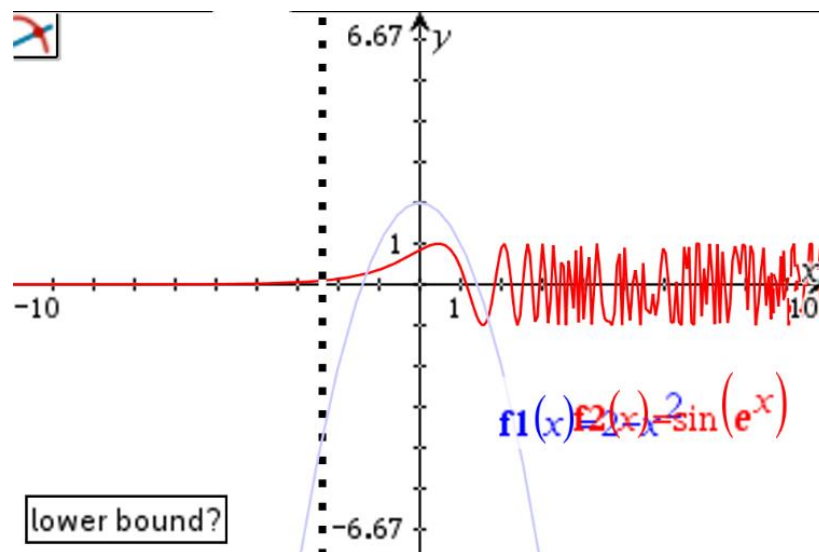
But this may not be the only solution. To check if there is another solution, we can graph $y = f(x)$ and $y = g(x)$ in a graphing document as shown below:



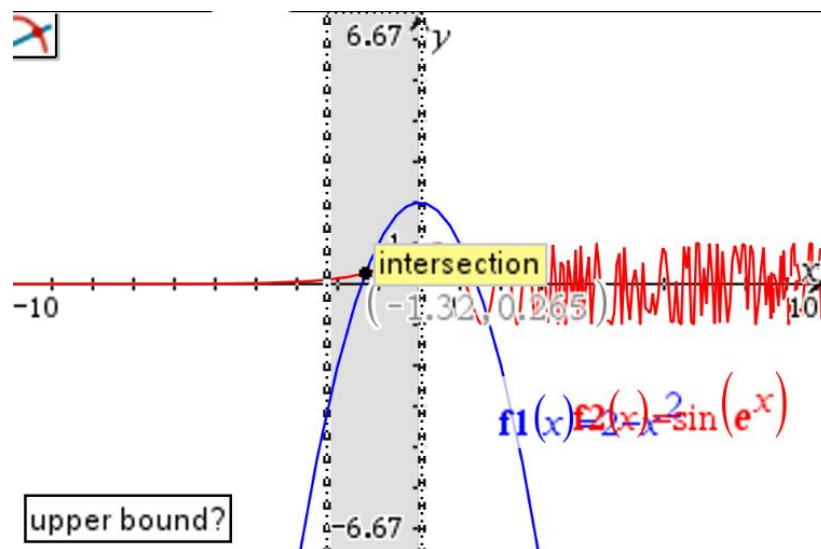
To find these points of intersection, press **Menu** then choose **Analyze Graph** then **Intersection**:



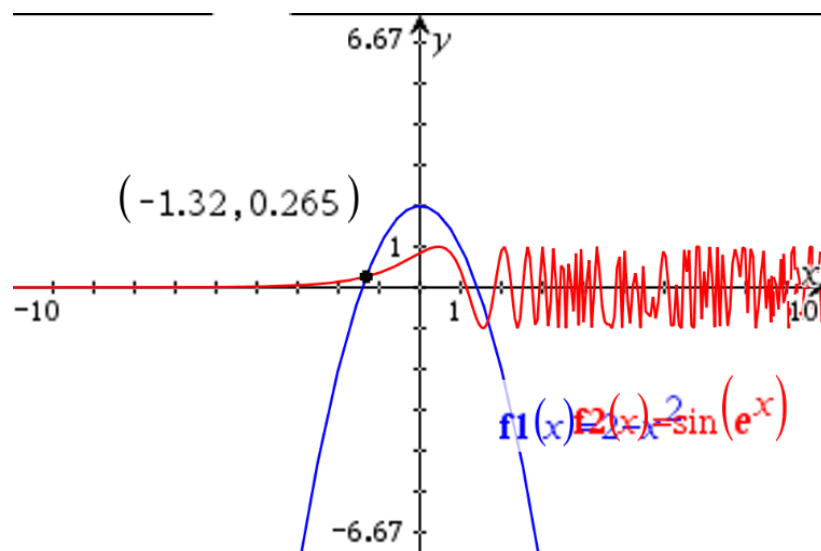
Choose your lower bound to the left of one of the points of intersection:



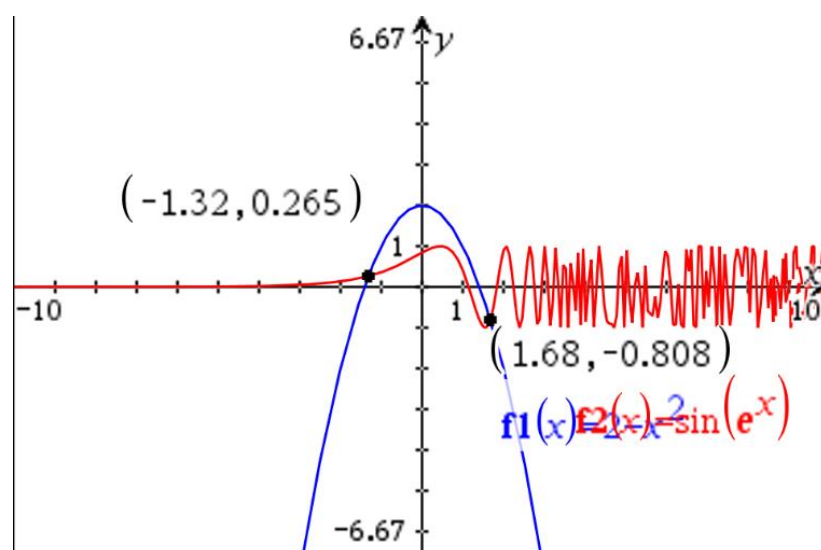
Then choose your upper bound to the right of the same point of intersection:



Then you can see the coordinates of that point of intersection:



Do the same to find the other point of intersection:



Your solution is the x-coordinates of both points of intersection.

$$x = -1.32, 1.68$$

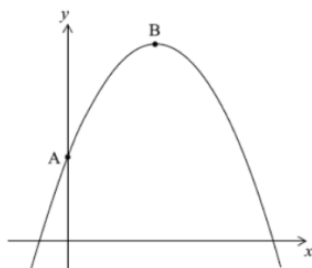
b) Write down the set of values for x such that $f(x) > g(x)$.

To answer part b) write down the interval of x -values for which the $f(x)$ function is above the $g(x)$ function on your graph.

$$-1.32 < x < 1.68$$

Exam Style Question 4 – Mathematical Studies

The graph of $f(x) = ax^2 + bx + c$ intersects the y -axis at $A(0, 5)$ and has its vertex at point $B(4, 13)$.



- a) Write down the value of c .
- b) Write down 2 equations involving a and b .
- c) Find the value of a and b .

The value of c is 5 since this is the y -intercept.

a)

$$c = 5$$

b)

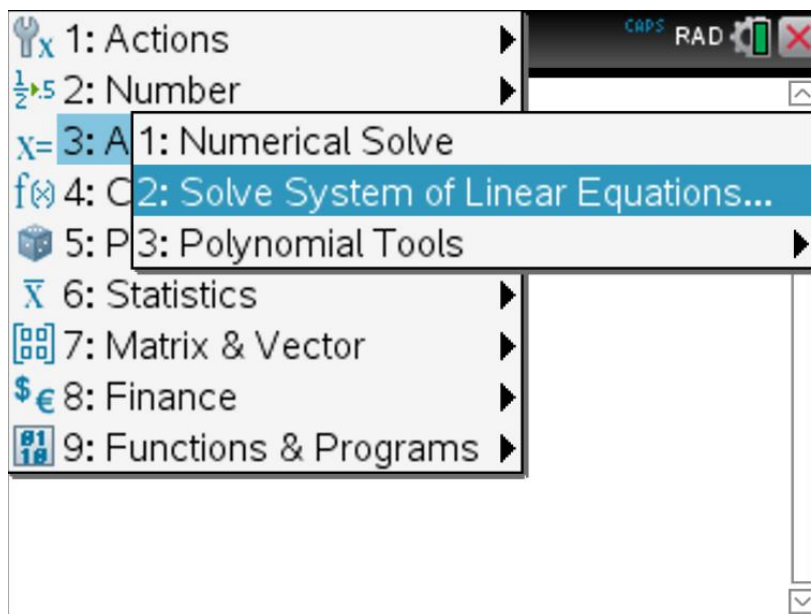
To find the 2 equations involving a and b, substitute the following points:

$$16a+4b+5=13 \text{ from } (4, 13)$$

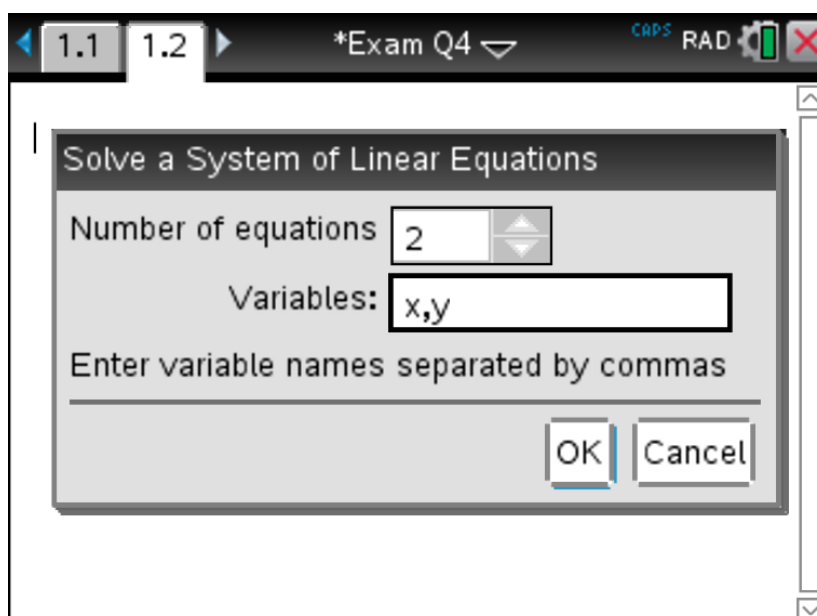
$$64a+8b+5=5 \text{ from } (8, 5) \text{ using symmetry}$$

c)

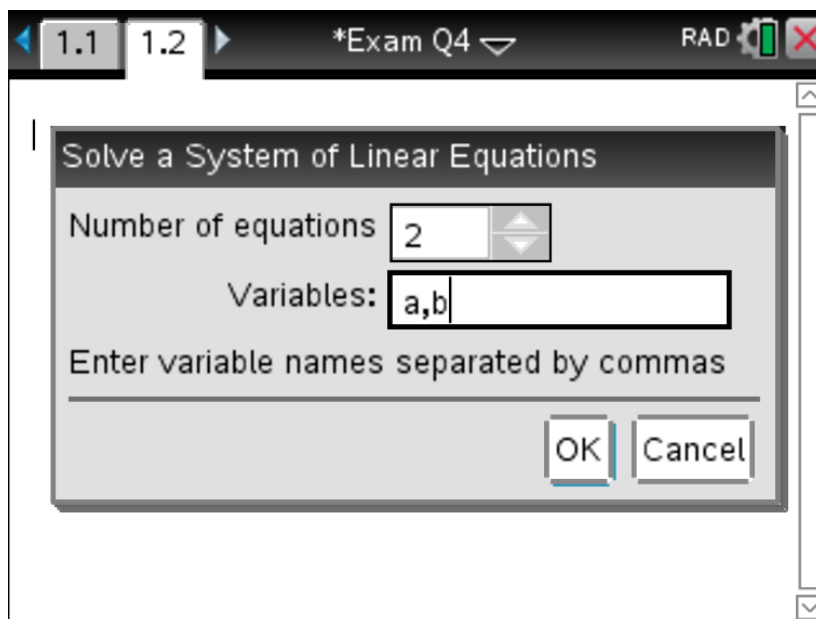
To solve these equations simultaneously, open a Calculator document then press **Menu** then choose **Algebra** and then **Solve System of Linear Equations**:



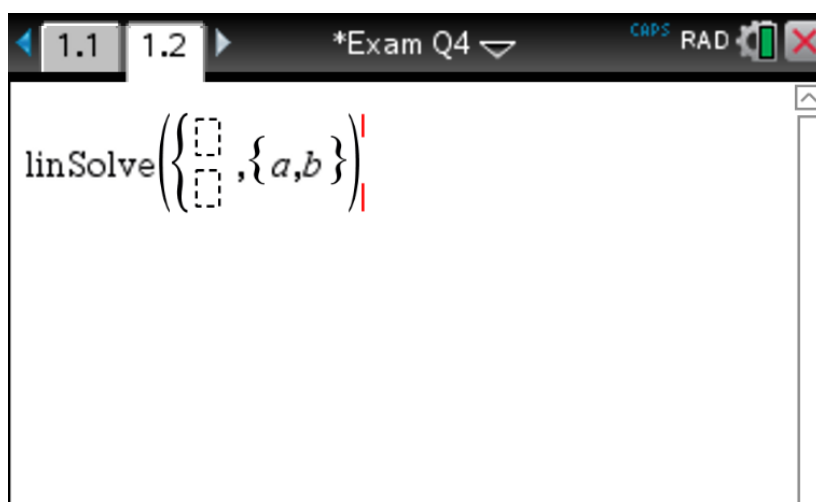
You will then get the following menu:



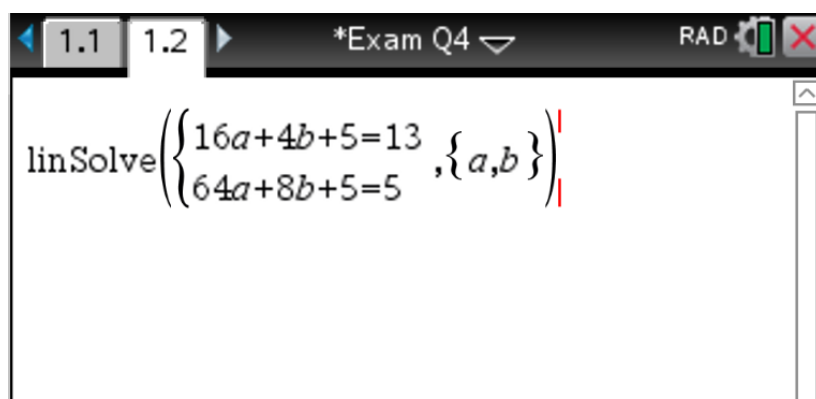
You can then change the variables to a and b, then press **OK**:



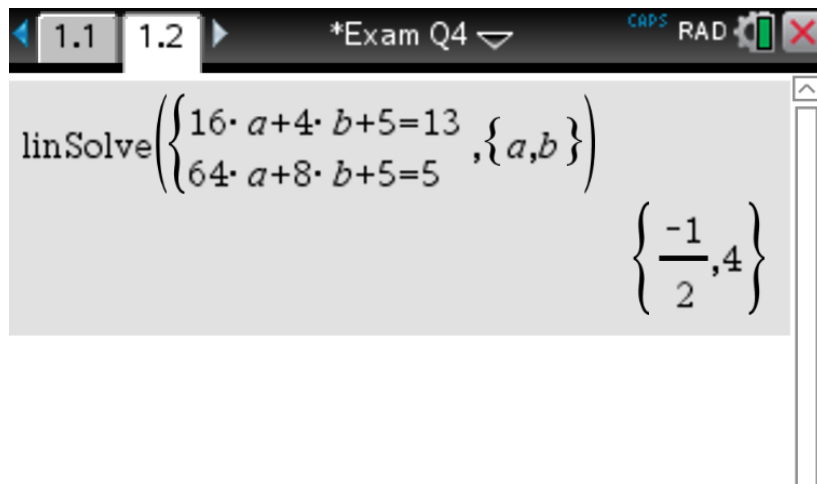
You will then get the following:



Type in your 2 equations:



Then press **Enter** to get your answer:



The image shows a TI-84 Plus calculator screen. The top status bar displays "1.1", "1.2", "*Exam Q4", "CAPS", "RAD", and a battery icon. The main display area shows the command $\text{linSolve}\left(\begin{cases} 16 \cdot a + 4 \cdot b + 5 = 13 \\ 64 \cdot a + 8 \cdot b + 5 = 5 \end{cases}, \{a, b\}\right)$. The result shown is $\left\{\frac{-1}{2}, 4\right\}$.

$$a = -1/2, b = 4$$

Exam Style Question 5: Mathematical Studies

The surface of a carpet is shown below. The dimensions are in metres.



a) Write down an expression for the Area of the carpet.

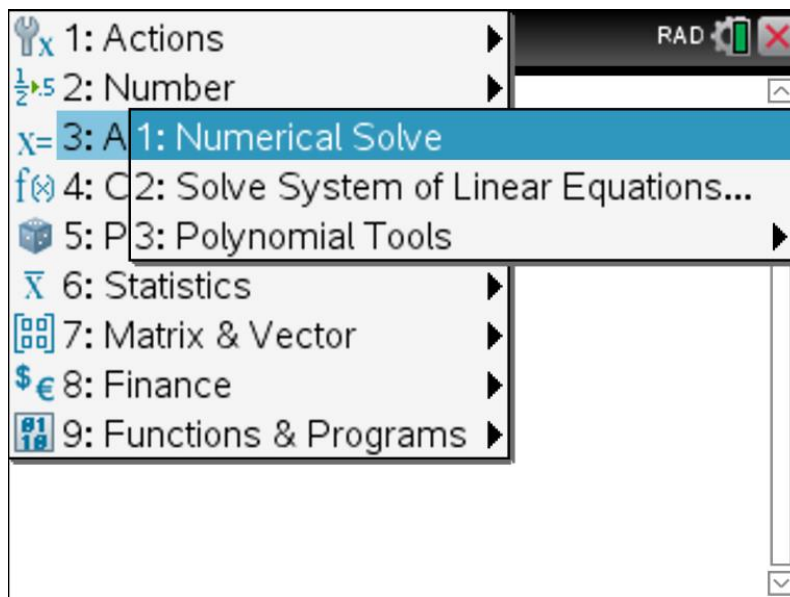
b) The area of the carpet is 10m^2 . Calculate the value of x .

a)

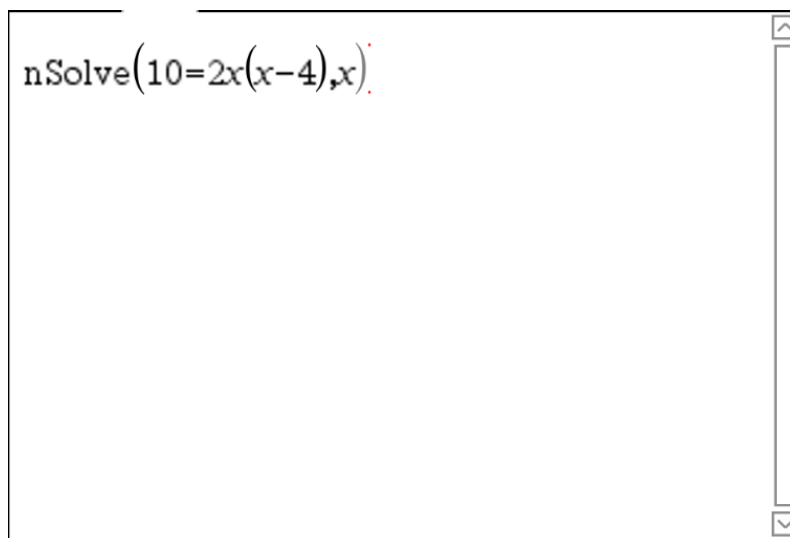
$$2x(x-4)$$

b)

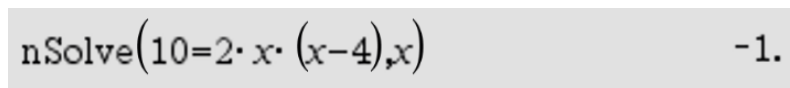
By equating the above expression to 10, we have an equation we can solve using **Numerical Solve**:



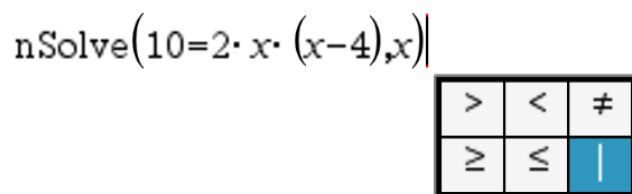
Enter your equation and the variable you want to solve for:



Press **Enter** to get an answer:



Since our answer should be positive, we can ask for the positive answer to the equation by pressing **CTRL** then = then choosing the vertical line:



Then type the inequality $x > 0$:

(To get the inequality symbol press **CTRL** then = then choose >)

`nSolve(10=2·x·(x-4),x)|x>0`



Then press **Enter**:

`nSolve(10=2·x·(x-4),x)|x>0`

5.

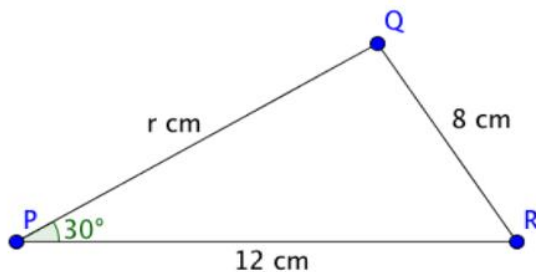


We get the answer of 5.

$$x = 5$$

Exam Style Question 6: Mathematics HL

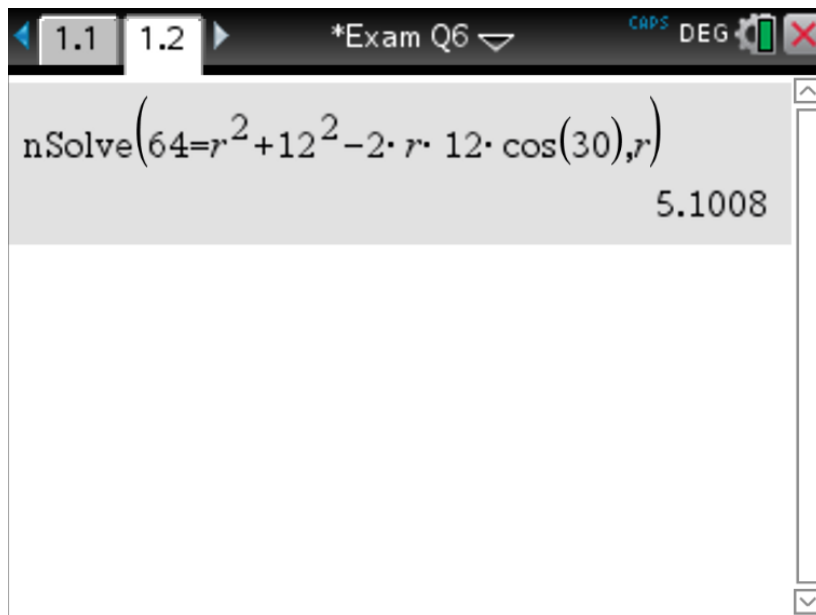
In triangle PQR, $PR = 12$ cm, $QR = 8$ cm, $PQ = r$ cm, and angle $QPR = 30^\circ$.



Calculate the two possible values of r .

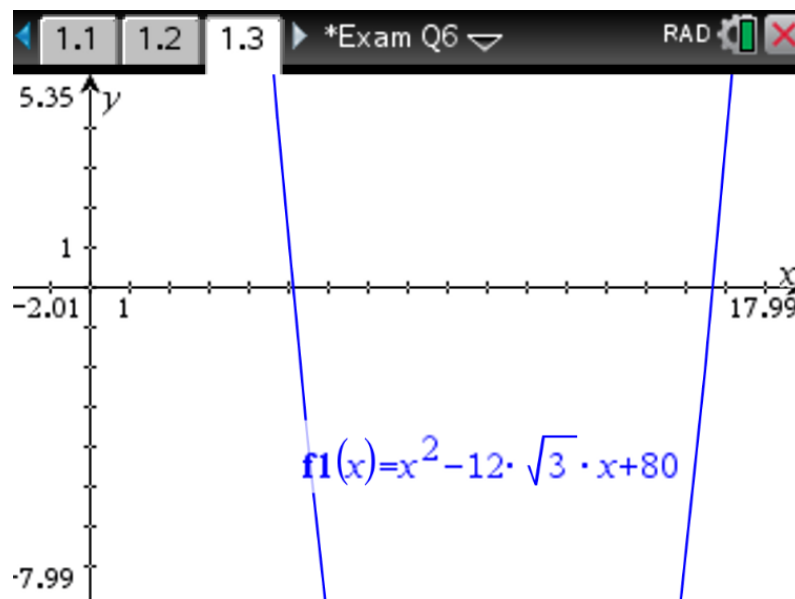
To find the value of r , we can create an equation using cosine rule. Most students think they need to rearrange or simplify the equation they get, but they can just put it in nSolve or graph the equation without simplifying it.

If we try solving the equation using cosine rule, we only get 1 solution:



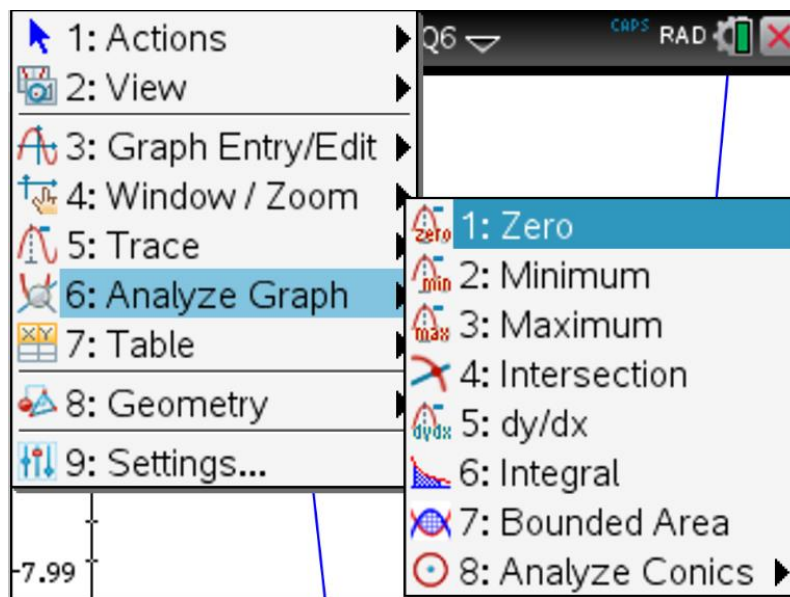
A TI-84 Plus calculator screen showing the nSolve function. The top status bar indicates "CAPS DEG" and "Exam Q6". The main display shows the equation $nSolve(64=r^2+12^2-2\cdot r\cdot 12\cdot \cos(30),r)$ and the result 5.1008 .

So the best thing is to use a graph. I chose to subtract the 64 from both sides in the above equation, then graph the right hand side:

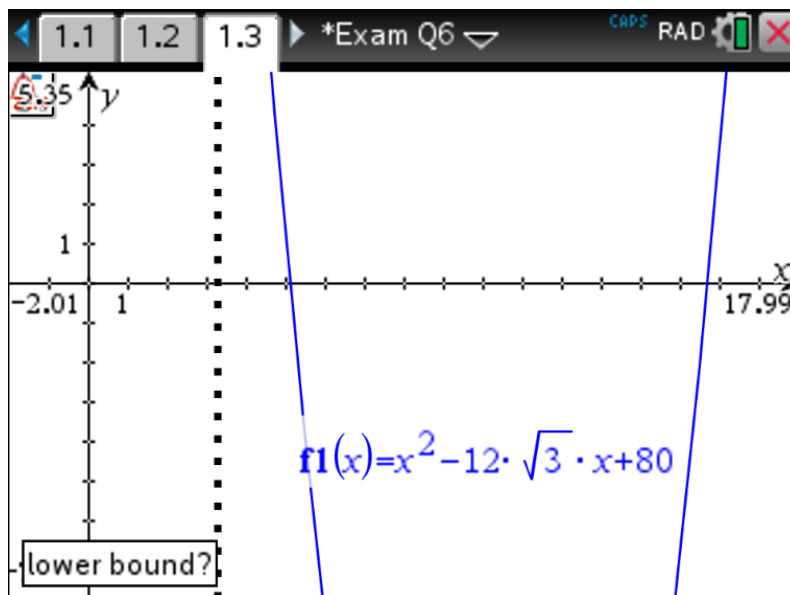


Now, I just need to find the x-intercepts or zeros to solve the question.

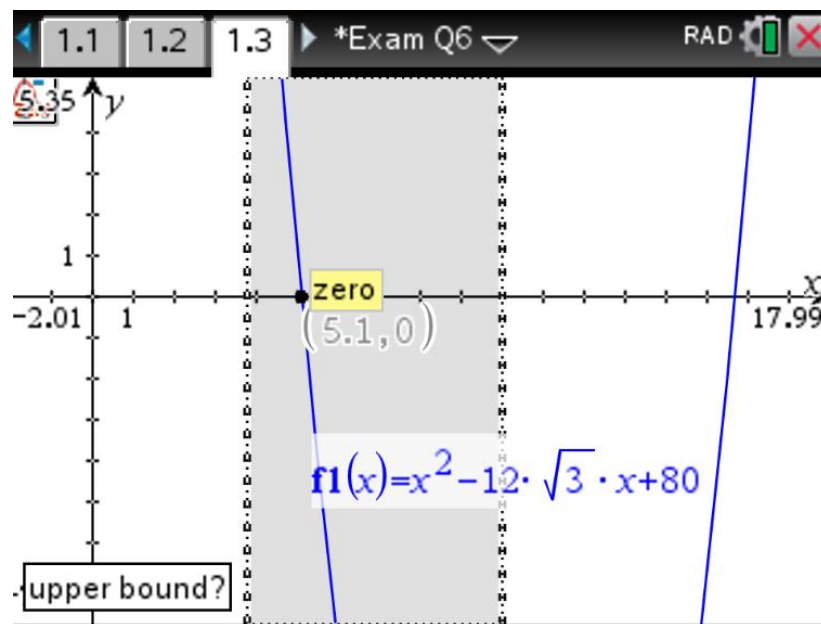
Press **Menu** then choose **Analyze Graph** then **Zero**:



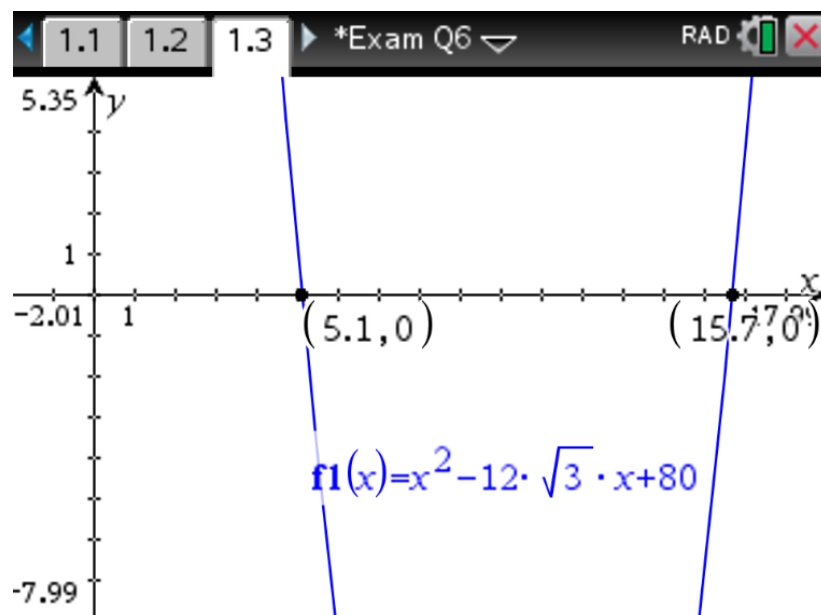
Choose the lower bound to the left of the zero:



Then choose the upper bound to the right:



Do the same for the other zero:



So the values of r are the x-coordinates of each zero.

$$r = 5.1, 15.7$$