**Year 2018**

**VCE**

**Mathematical Methods**

**Trial Examination 2**

**Solutions**

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**SECTION A**

**ANSWERS**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **2** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **3** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **4** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **5** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **6** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **7** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **8** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **9** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **10** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **11** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **12** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **13** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **14** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **15** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **16** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **17** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **18** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **19** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |
| **20** |  | **A** |  | **B** |  | **C** |  | **D** |  | **E** |

**SECTION A**

**Question 1 Answer C**



 included



 not included, so the domain is 

## Question 2 Answer E



 the remainder is .

## Question 3 Answer D

All of the functions **A. B. C.** and **E.** join up when ,

**D.**  when  gives 

## Question 4 Answer B

 and 

equal gradients when 

There is a unique solution when , Colin is correct.

When  the equations become  and ,

these are multiples, so there is an infinite number of solution when 

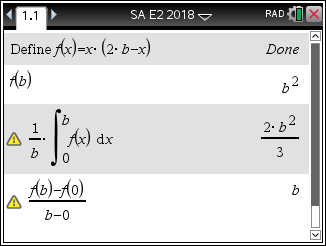
When  the equations become  and ,

these are inconsistent, the lines are parallel with different *y* intercepts,

so there is no solution when  Ben is correct.

## Question 5 Answer E



**Question 6 Answer D**

 where 

 so the range is  Alan is incorrect.

The average value of the function is 

The average rate of change of the function is , so Ben is correct.

The gradient, since ,  the function is always increasing and that the gradient at an end-point  does not exist, David is correct.

**Question 7 Answer A**

6 B, 5R, total 11, at least one of each colour



**Question 8 Answer A**

The graph has a vertical asymptote at  so .

The graph crosses the *x*-axis when , at a negative value , 

The graph crosses the *y*-axis when , at a positive value



## Question 9 Answer B



**Question 10 Answer D**



  **A.** is true

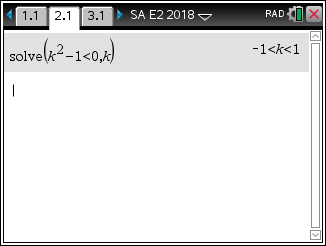


  **B.** is true

 **C.** is true

 **E.** is true **D.** is false

**Question 11 Answer C**

 and 





do not intersect when  

## 

## Question 12 Answer E

## 



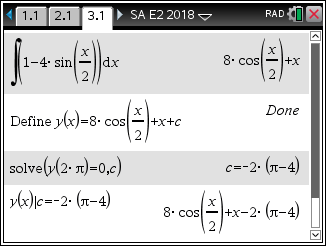
 take negative since 





## Question 13 Answer B

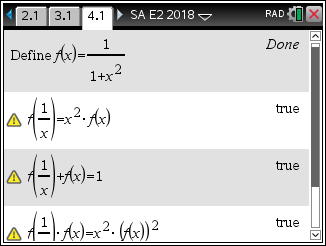
If  is a non-zero even function, then , the graph is symmetrical about the *y*-axis so . If is a non-zero odd function, then , then , so 

**Question 14 Answer B**



to find *c*, 





**Question 15 Answer E**

 **A. B. C. D.** are all true

## E. is false

## 

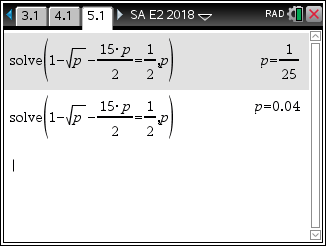
## Question 16 Answer A

The graph of  is transformed into the graph of  since  by

A dilation by a scale factor of  parallel to the *y*-axis, a reflection in the *x*-axis,

and a translation of  to the right parallel to the *x*-axis.

**Question 17 Answer C**

 ,  , 

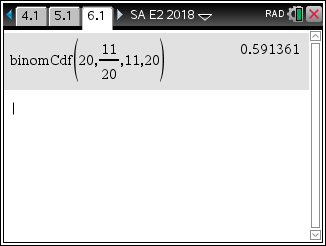
|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## 



solving  gives 

## Question 18 Answer D

 have blue eyes. 



## Question 19 Answer C

Given  and 

since , , then





**Question 20 Answer A**



into 

**END OF SECTION A SUGGESTED ANSWERS**

**SECTION B**

**Question 1**

**a.**  the maximum on  is when 

, centre of the circle  A1



 A1

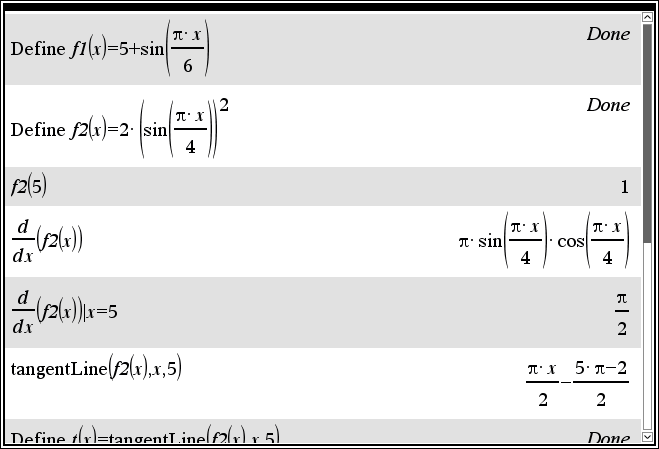
**b.i.**  



 A1



 A1



**ii.** solving with  M1

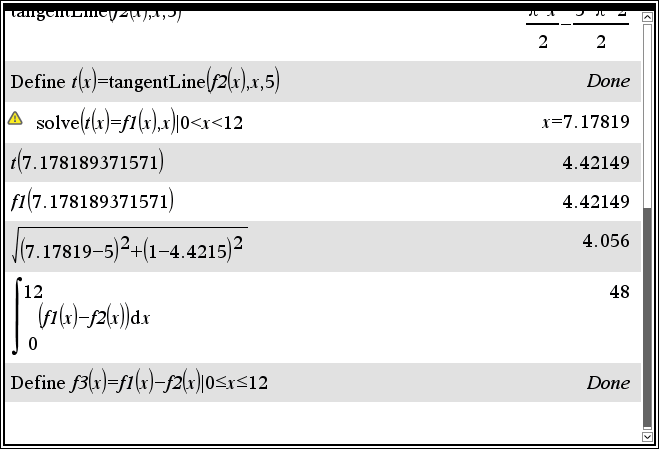


gives 

 A1

**iii.** 

 A1



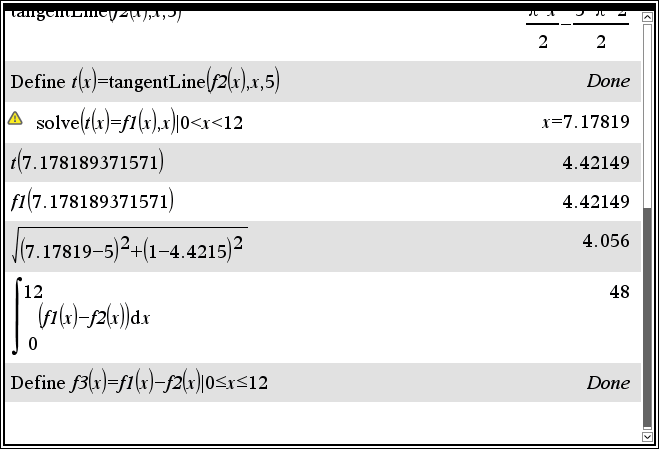
**c.i.** The circular island has a radius of 1 and an area of .

The area of water in the pool is

 A1

**ii.** 

 A1

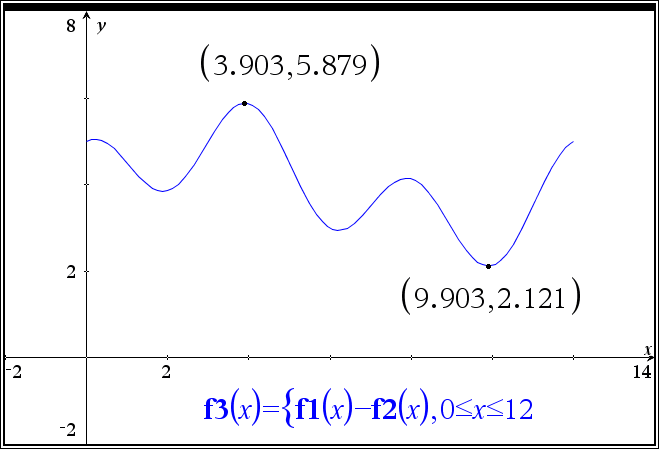


**d.** 

graphically find the maximum and minimum of *s*, or using  M1

the maximum value of *s* occurs when  and the maximum width is m A1

the minimum value of *s* occurs when  and the minimum width is  m A1



**Question 2**

**a.i. **

****

 for two stationary points

 A1

**ii.** Given that 

****

for two stationary points  A1

 M1

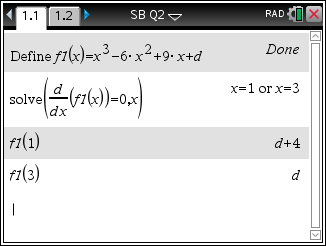
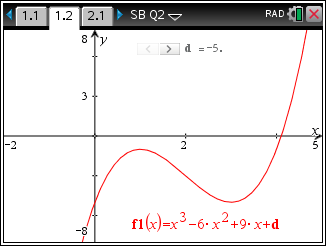
so stationary points at  is the maximum turning

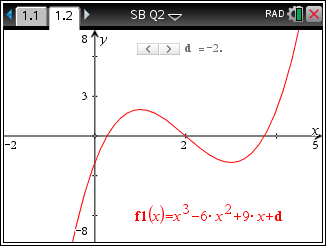
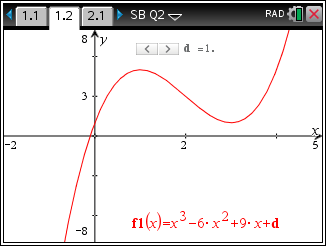
and  is the minimum turning point.

The graph crosses the *x*-axis three times if

 and  that is

 A1



****

**iii.** If the stationary point is at  then from **a.ii.** 

one stationary point is  so

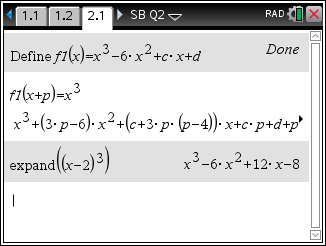
 and the other stationary point is  A1

**b.i. **

 for one stationary point

 A1

**ii. **

 ****

 M1

equation coefficients



 A1

alternatively 

**c.** crosses the *y*-axis at 

 the tangent is 

so  and 

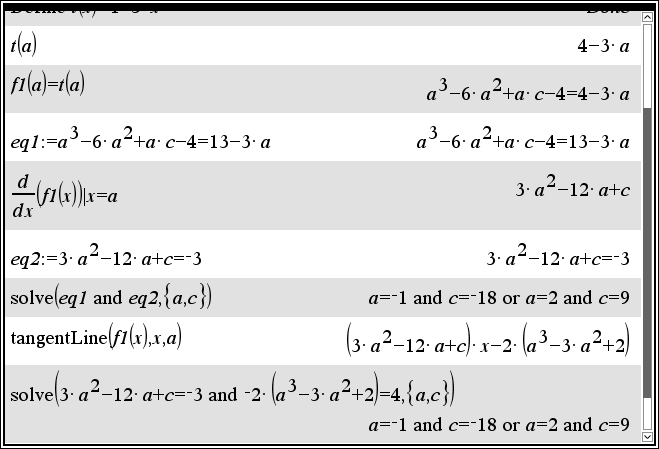


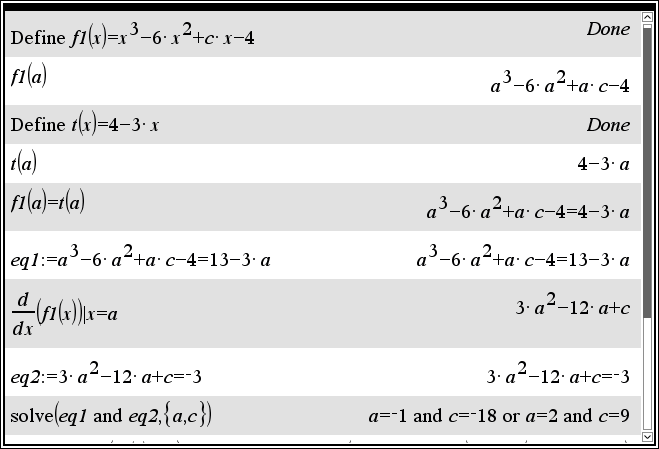
 the tangent has a gradient of , therefore M1



solving  and  gives  and  or  and  A1

both pairs of answers are acceptable.





**d.i.** , 

using four equally spaced intervals, 

 A1

 A1

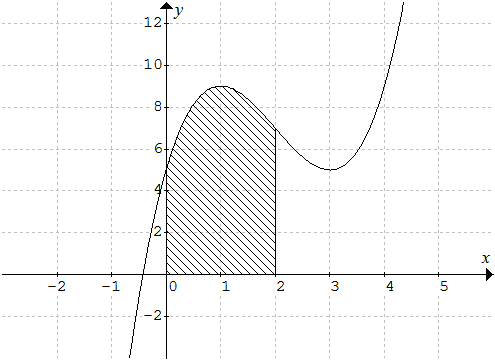
alternatively 

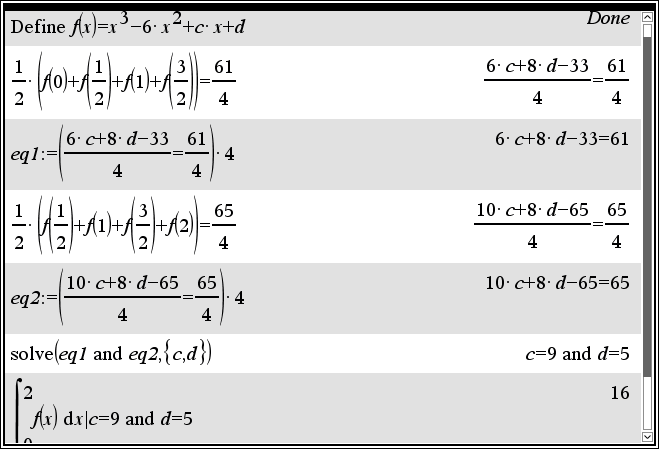


or solving 

 A1

**ii.** stationary points  and the *y*-intercept at  G1





**Question 3**

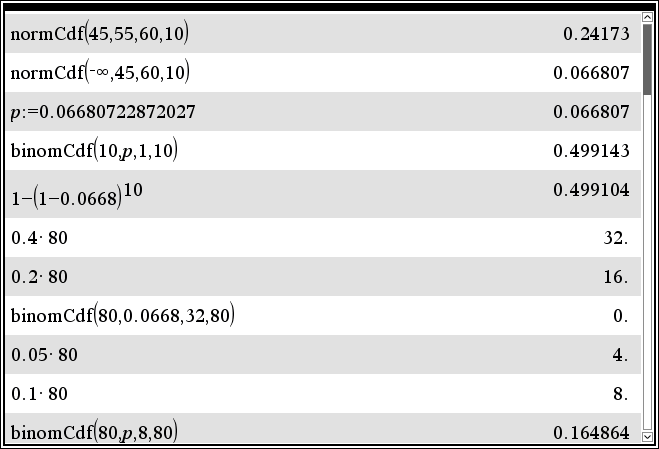
**a.** Let the burning time in minutes be 

**i.**  A1

**ii.**  A1

**iii.** For the cake 

 A1

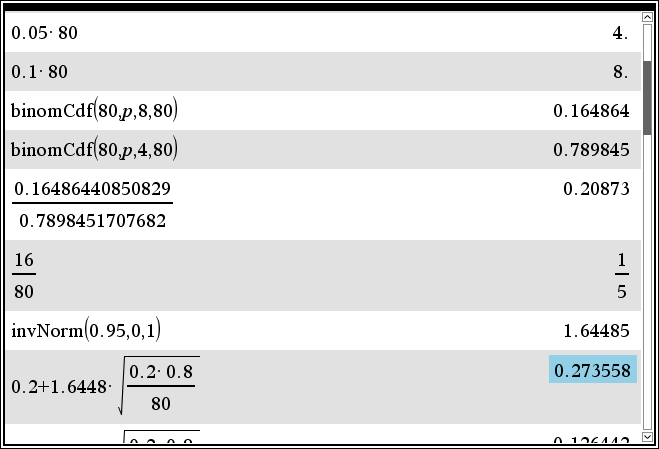


**b.i.**  

 M1



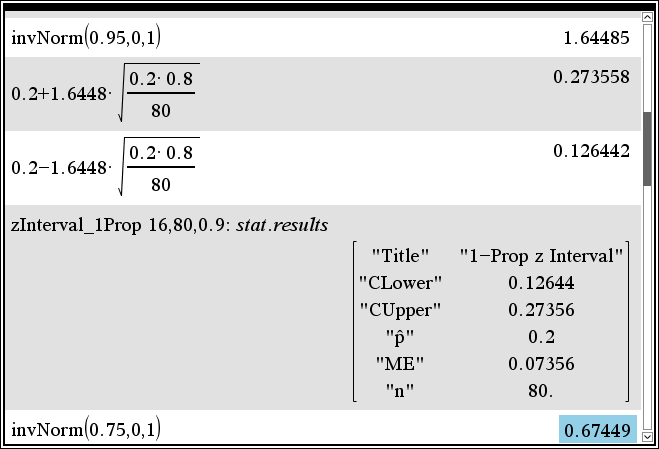
 A1



**ii.** 



 A1

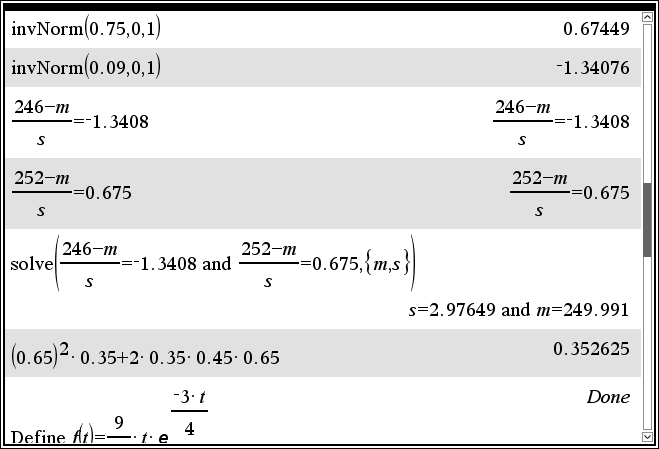


**c.** long life candles 

 M1

 A1

solving  gives  minutes A1



**d.** *I* ice-cream cake, *C* chocolate cake



 M1



 A1

**e.i**  M1

 A1

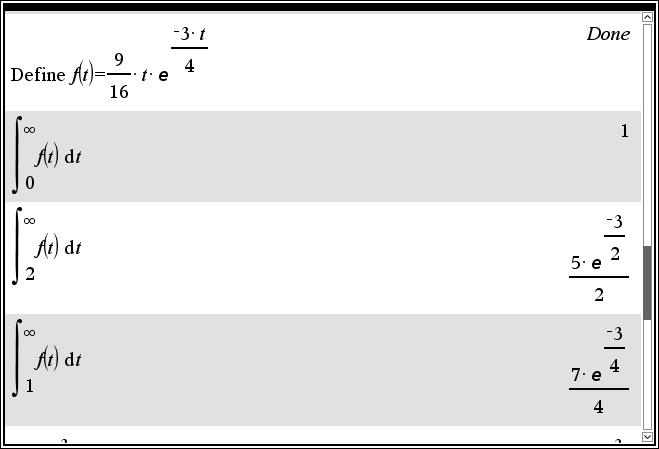
**ii.**  A1



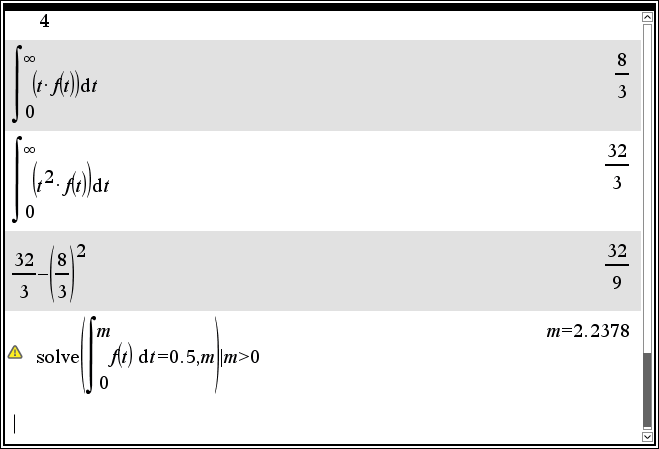


 A1

**iii.** Solving  gives  A1







**Question 4**

**a.** maps onto 

 M1



  A1

**b.** 

 A1

**c.** 

 M1

but 

 A1

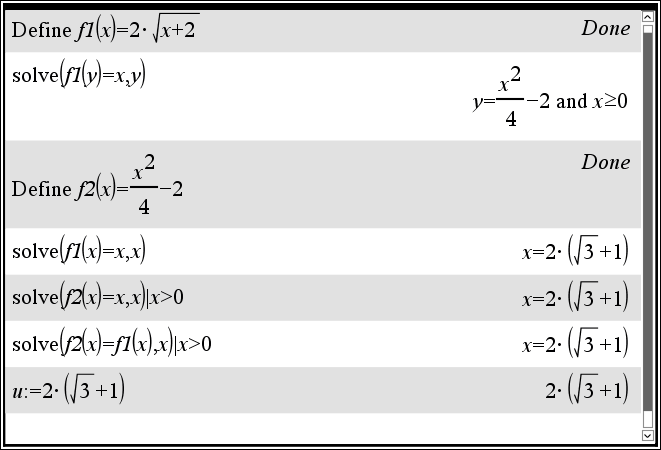
**d.** solving  or  or , with 

it is easiest to solve 



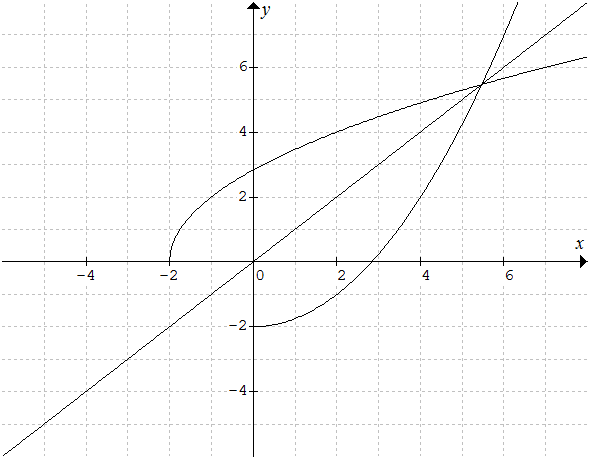
 so  but 

 A1



**e.** G2

*f*



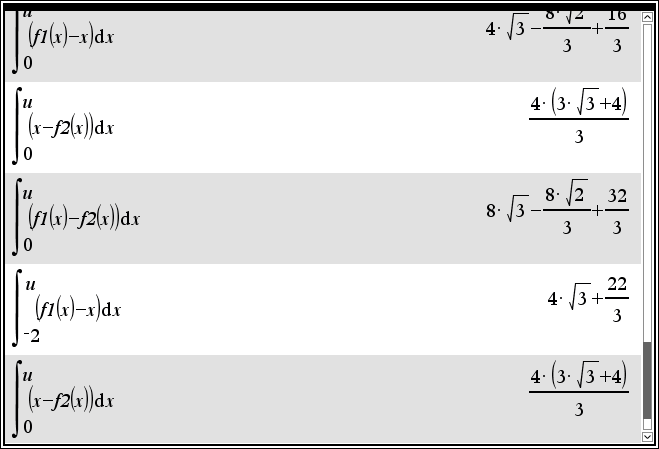


**f.i.** 

 A1

**ii.** 

 A1



**g.** 

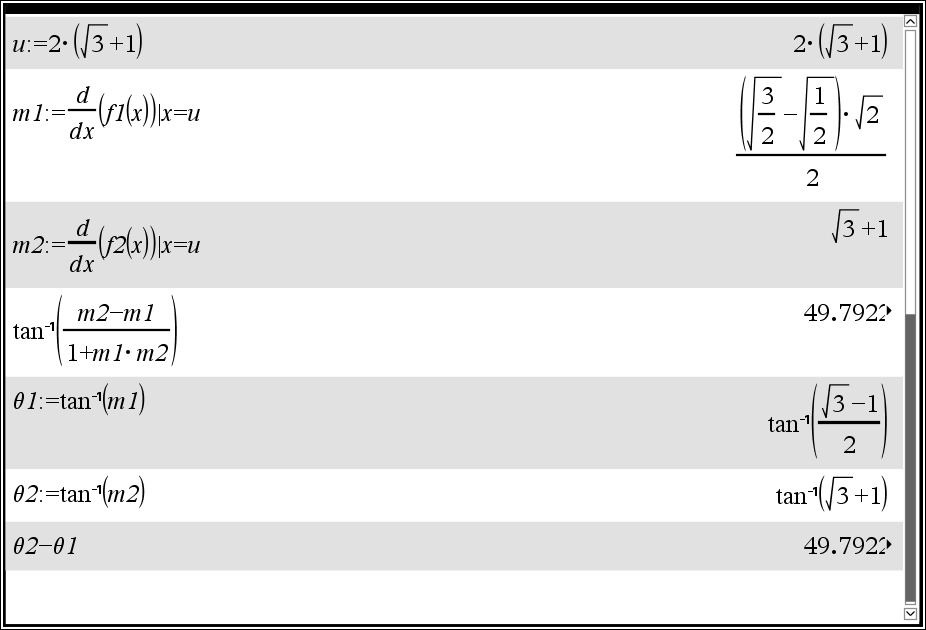
 A1





or alternatively 

 A1



**h.** a translation of *k* units to the left parallel to the *x*-axis, or away from the *y*-axis

and a dilation by a factor of *k*, parallel to the *y*-axis or away from the *x*-axis. A1

**i.** 

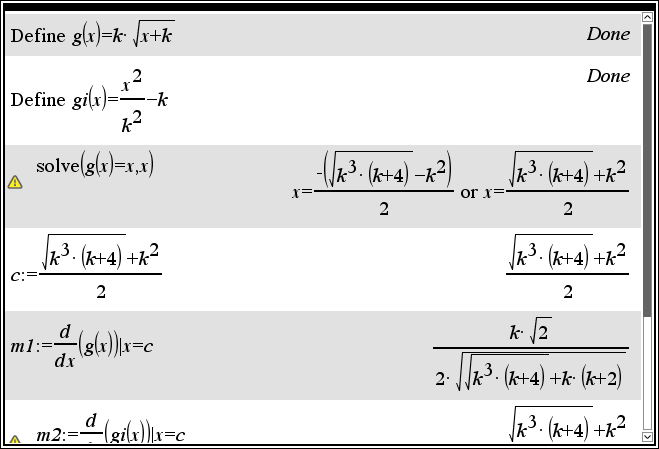


but 

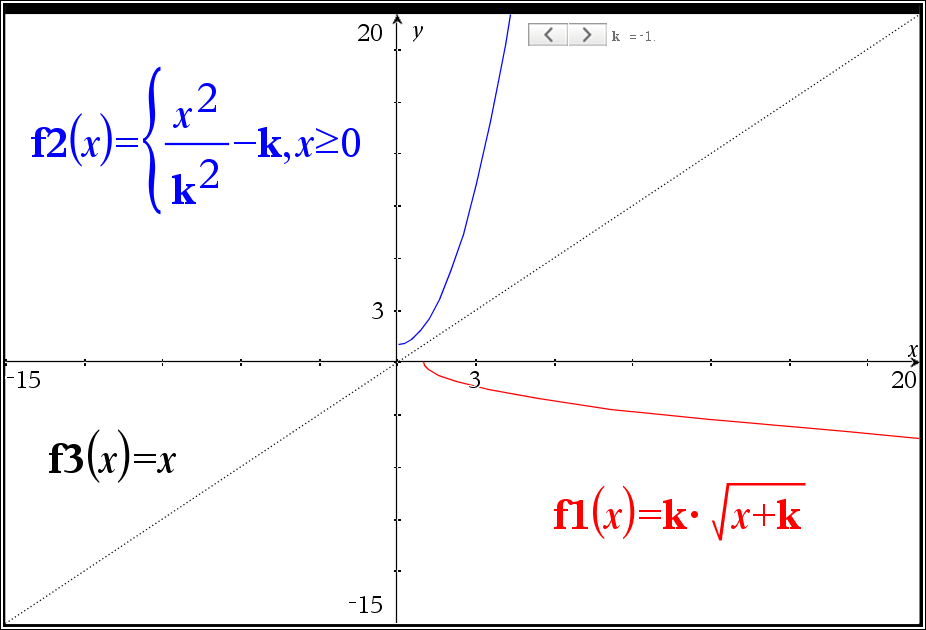
 A1

**j.** solving  or  or , with  gives

 A1



**k.**  A1

****

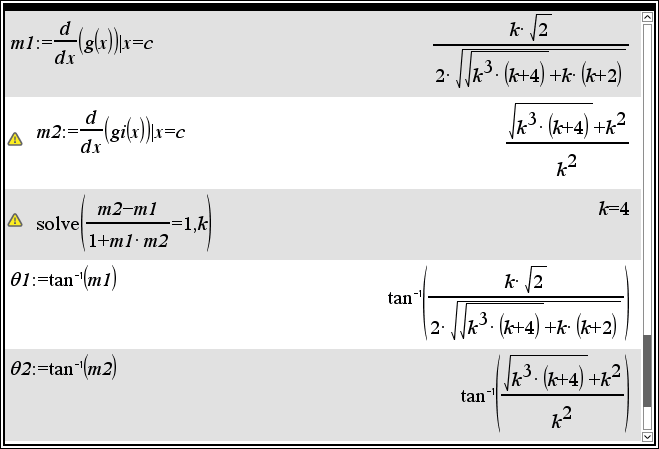
**l.** Let  when  and  when  M1

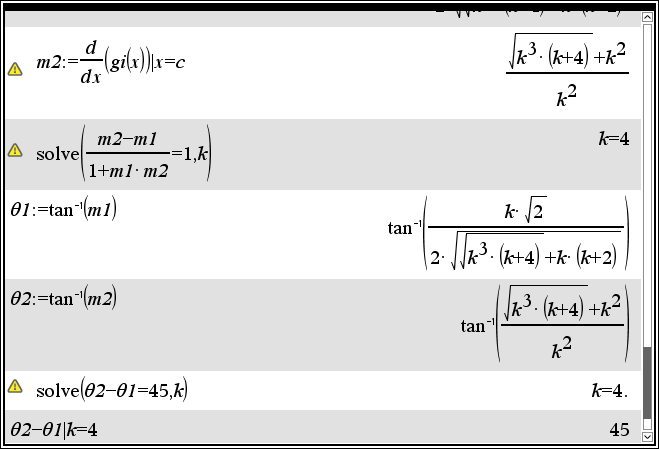
given  solving  for *k*, with 

as the graphs do not intersect when  gives

 A1

or alternatively , solving  for *k*





**END OF SECTION B SUGGESTED ANSWERS**