

**KS5 "Full Coverage": Functions**

This worksheet is designed to cover one question of each type seen in past papers, for each A Level topic. This worksheet was automatically generated by the DrFrostMaths Homework Platform: students can practice this set of questions interactively by going to www.drfrostmaths.com, logging on, *Practise Past Papers* (or *Library Past Papers* for teachers), and using the ‘Revision’ tab.

**Question 1  
Categorisation: Find the expression of a function for some arbitrary algebraic input, e.g. .**

*[Edexcel C3 June 2014(R) Q6c]* The function is defined by

 ,

Solve the equation

giving your answer in its simplest form.

..........................

**Question 2  
Categorisation: Use for known and to find the value of unknown coefficients in a function.**

*[Edexcel A2 Specimen Papers P1 Q5ai Edited]*

 , where is a constant

Given that  , find the value of .

..........................

**Question 3  
Categorisation: Some functional equations involving exponential terms.**

*[Edexcel C3 June 2012 Q6c]* The functions   and are defined by

Find the exact value of   for which .

..........................

**Question 4  
Categorisation: Find the output of a composite function.**

*[Edexcel A2 Specimen Papers P1 Q10c]*

The function is defined by

The function is defined by

Find the value of .

..........................

**Question 5  
Categorisation: Determine a composite function.**

*[Edexcel A2 Specimen Papers P1 Q10b]* The function is defined by

Show that

where is an integer to be found.

..........................

**Question 6  
Categorisation: Solve a functional equation involving a composite function.**

*[Edexcel C3 June 2014(R) Q6e]* The function is defined by

 ,  , is a positive constant.

The function is defined by

 ,

Find, in terms of the constant  , the solution of the equation .

..........................

**Question 7  
Categorisation: Solve an equation involving a modulus function within a composite function.**

*[OCR C3 June 2016 Q8iii Edited]*

The functions   and   are defined for all real values of by

  and

where is a positive constant.

Solve for   the equation .

..........................

**Question 8  
Categorisation: As above.**

*[OCR C3 June 2015 Q8iii]*

The functions   and are defined as follows:

  for

  for all real values of  , where is a positive constant.

Given that  , find the value of .

..........................

**Question 9  
Categorisation: Appreciate that is not necessarily the same as .**

*[Edexcel A2 SAM P2 Q4b Edited]*

Given

 ,

 ,  ,

It can be shown that .

Show that there is only one real value of   for which , stating this solution.

..........................

**Question 10  
Categorisation: Appreciate that is not the same as .**

*[Edexcel C3 June 2013(R) Q4d]*

The functions   and are defined by

 ,   ,

Solve the equation

..........................

**Question 11  
Categorisation: Determine the range of a composite function.**

*[Edexcel C3 June 2011 Q4d]*

The function is defined by

 ,  ,

The function g is defined by

 ,

Find the range of .

..........................

**Question 12  
Categorisation: As above.**

*[Edexcel C3 Jan 2006 Q8c Edited]*

The functions   and are defined by

 ,

 ,

It can be shown that

Write down the range of .

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**Question 13  
Categorisation: Use a graph to find the output of a composite function.**

*[Edexcel C3 Jan 2013 Q3a]*

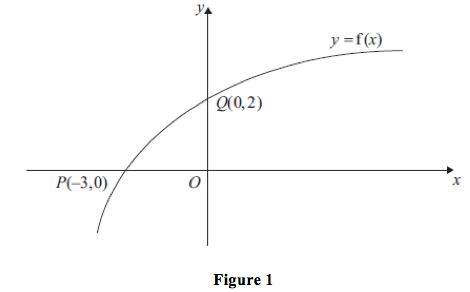


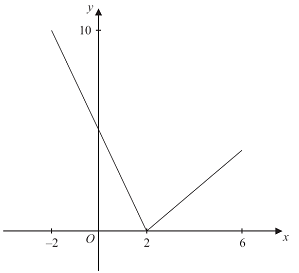
Figure 1 shows part of the curve with equation  , *.* The curve passes through the points *Q*(0, 2) and *P*(−3, 0) as shown.

Find the value of .

..........................

**Question 14  
Categorisation: As above.**

*[Edexcel C3 June 2013 Q7b]* The function   has domain   and is linear from   to   and from   to  . A sketch of the graph is shown in the figure.



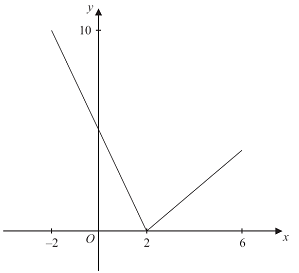
Find .

..........................

**Question 15  
Categorisation: Use a function expressed graphically combined with a function expressed algebraically to solve an equation involving a composite function.**

*[Edexcel C3 June 2013 Q7d]*

The function   has domain   and is linear from   to   and from   to  . A sketch of the graph is shown in the figure.



The function   is defined by  , and it can be shown that

Solve the equation .

..........................

**Question 16  
Categorisation: Determine whether a function has an inverse.**

*[Edexcel A2 Specimen Papers P1 Q10e Edited]*

The function is defined by

Decide whether the function has an inverse.

[   ] It has an inverse   
[   ] It has not an inverse

**Question 17  
Categorisation: Determine an inverse function.**

*[Edexcel A2 Specimen Papers P1 Q10a]*

The function is defined by

Find

..........................

**Question 18  
Categorisation: Solve an equation involving an inverse function.**

*[Edexcel C3 June 2014 Q5c]*

 ,

Find the exact value of   for which

..........................

**Question 19  
Categorisation: Solve an equation involving an inverse trig function.**

*[Edexcel C3 June 2016 Q7b]*

 ,

Find the exact value of for which

..........................

**Question 20  
Categorisation: Find the inverse of a logarithmic function.**

*[Edexcel C3 Jan 2007 Q6a Edited]*

The function is defined by

 ,   and

Find the inverse function of .

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**Question 21  
Categorisation: Determine the domain or range given parametric functions.**

*[Edexcel A2 Specimen Papers P2 Q10a]*

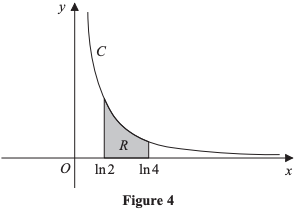


Figure 4 shows a sketch of the curve with parametric equations

State the domain of values of   for the curve .

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**Question 22  
Categorisation: Determine the range of a quadratic function.**

*[Edexcel A2 Specimen Papers P1 Q10d]*

The function is defined by

Find the range of .

..........................

**Question 23  
Categorisation: As above.**

*[Edexcel C3 June 2010 Q4d]*

The function is defined by

 ,  , .

Find the range of .

..........................

**Question 24  
Categorisation: Determine the range of a function involving a square root.**

*[Edexcel C3 June 2017 Q3a]*

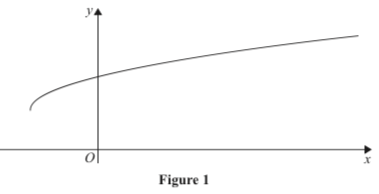


Figure 1 shows a sketch of part of the graph of , where

 ,

State the range of .

..........................

**Question 25  
Categorisation: Determine the domain of an inverse function.**

*[Edexcel C3 June 2014(R) Q6b]*

The function is defined by

 ,  , is a positive constant.

Find and state its domain.

..........................

**Question 26  
Categorisation: Determine the range of a function involving an exponential term.**

*[Edexcel C3 June 2014(R) Q6a]* The function is defined by

 ,  , is a positive constant.

State the range of .

..........................

**Question 27  
Categorisation: Determine the range of a modulus function.**

*[Edexcel C3 June 2013(R) Q4a]* The functions   and are defined by

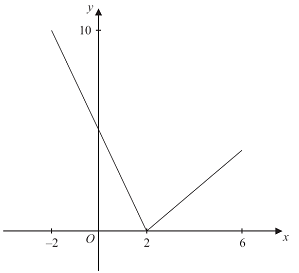
 ,   
 ,

State the range of .

..........................

**Question 28  
Categorisation: Determine a domain/range given a graph.**

*[Edexcel C3 June 2013 Q7a]* The function   has domain   and is linear from   to   and from   to  . A sketch of the graph is shown in the figure.



Write down the range of .

..........................

**Question 29  
Categorisation: Appreciate that the domain of an inverse function is the same as the range of the original function (except with modified notation).**

*[Edexcel C3 June 2011 Q4b]* The function is defined by

 ,  ,

Find the domain of .

..........................

**Question 30  
Categorisation: Determine the range of a composite function.**

*[Edexcel C3 Jan 2009 Q5c Edited]*

The functions   and are defined by

 ,  ,

 ,

It can be shown that  ,

Write down the range of .

..........................

**Question 31  
Categorisation: Consider the number of points of intersection of a modulus graph with another graph.**

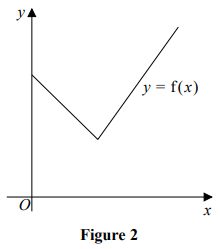
*[Edexcel A2 SAM P2 Q11c]*

Figure 2 shows a sketch of part of the graph , where

 ,

Given that the equation  , where   is a constant, has two distinct roots, state the set of possible values for .

..........................

**Question 32  
Categorisation: Solve an equation involving a modulus function.**

*[Edexcel A2 SAM P2 Q11b] (Continued from above)*

 ,

Solve the equation

..........................

**Question 33  
Categorisation: Find the range of a modulus function.**

*[Edexcel A2 SAM P2 Q11a]* *(Continued from above)*

 ,

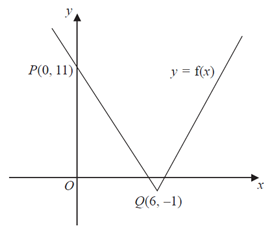
State the range of .

..........................

**Question 34  
Categorisation: Use a given modulus graph to find unknowns within the equation.**

*[Edexcel C3 June 2014 Q4c]*

The figure shows part of the graph with equation  ,



Given that  , where   and   are constants, state the value of   and the value of .

..........................

**Question 35  
Categorisation: The reverse: Use an equation involving a modulus expression to find unknown points within its graph.**

*[Edexcel C3 June 2005 Q6c]*

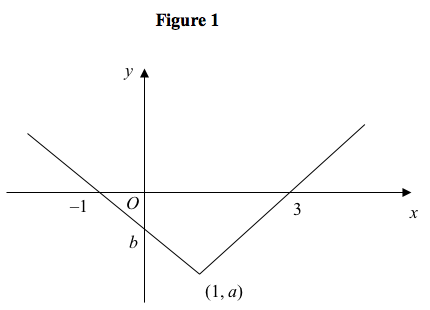


Figure 1 shows part of the graph of  ,  . The graph consists of two line segments that meet at the point  ,  . One line meets the *x*-axis at (3, 0). The other line meets the  -axis at (–1, 0) and the  -axis at  , *.*

Given that  , find the value of   and the value of .

..........................

**Question 36  
Categorisation: Solve an equation involving a modulus expression and unknown constants.**

*[Edexcel C3 June 2017 Q6b]*

Given that and are positive constants, and that the equation

has a solution at   and a solution at  , find   in terms of .

..........................

**Question 37  
Categorisation: Reason about an asymptote in a modulus graph.**

*[Edexcel C3 June 2016 Q4aiii]*

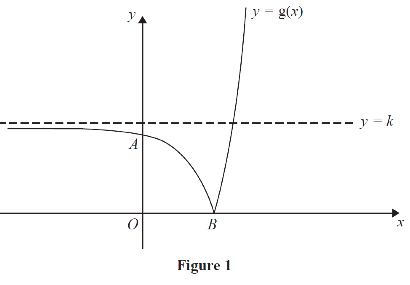


Figure 1 shows a sketch of part of the curve with equation , where

 , .

The curve cuts the  -axis at the point   and meets the  -axis at the point  . The curve has an asymptote  , where is a constant, as shown in Figure 1.

Find the value of the constant , giving your answer in its simplest form.

..........................

**Question 38  
Categorisation: Solve modulus equations involving an exponential term.**

*[Edexcel C3 June 2015 Q2c]*

Let  , .

Find the exact solutions of the equation

..........................

**Question 39  
Categorisation: Solve modulus equations involving a reciprocal graph.**

*[Edexcel C3 June 2007 Q5d]* The functions   and are defined by

 ,  ,

 ,  ,

Find the exact values of   for which

..........................

**Question 40  
Categorisation: Solve equations where the modulus term is being subtracted.**

*[Edexcel C3 June 2008 Q3d]*

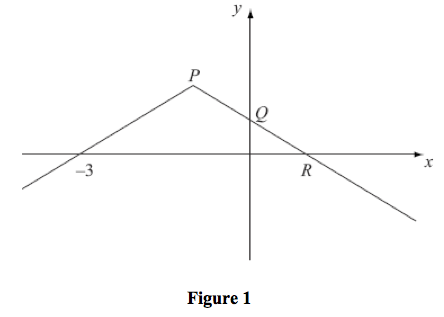


Figure 1 shows the graph of  , . The graph consists of two line segments that meet at the point .

The graph cuts the  -axis at the point   and the  -axis at the points (–3, 0) and .

Given that  , solve .

..........................

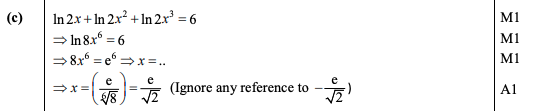
**Question 41  
Categorisation: Solve an inequality involving a modulus term.**

*[Edexcel C3 June 2014(R) Q5c]* By a suitable sketch of   or otherwise, find the complete set of values of for which

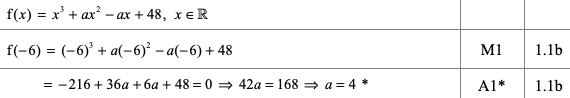
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**Answers**

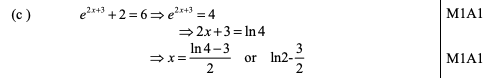
**Question 1**



**Question 2**



**Question 3**

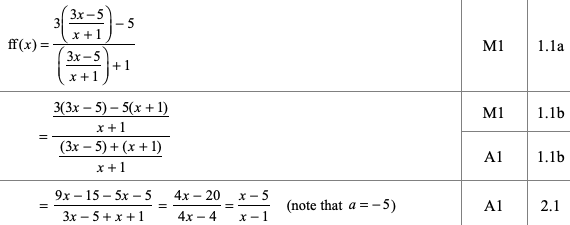


**Question 4**

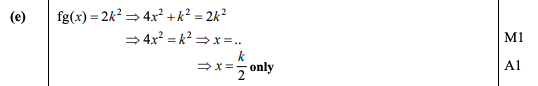
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**Question 5**

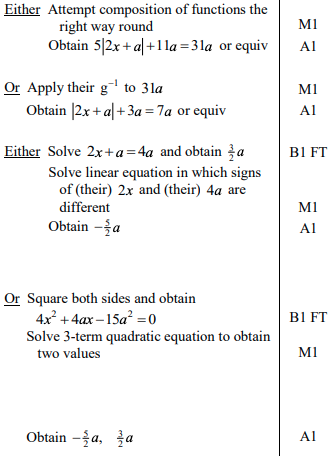


**Question 6**

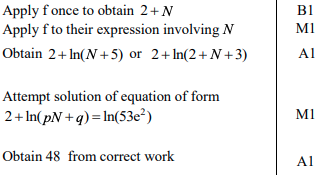


**Question 7**

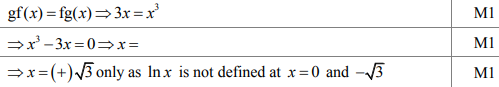
  or



**Question 8**

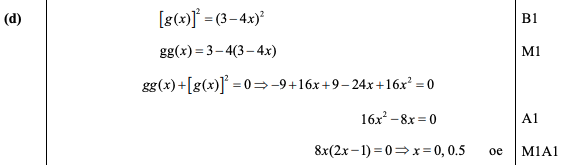


**Question 9**



**Question 10**

  or



**Question 11**

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**Question 12**

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**Question 13**

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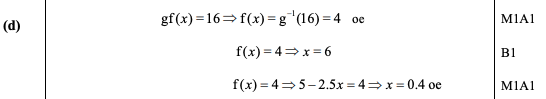
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**Question 14**

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**Question 15**

  or

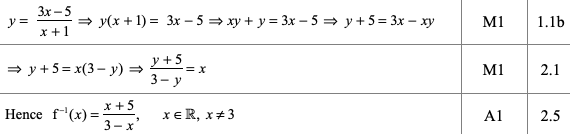


**Question 16**

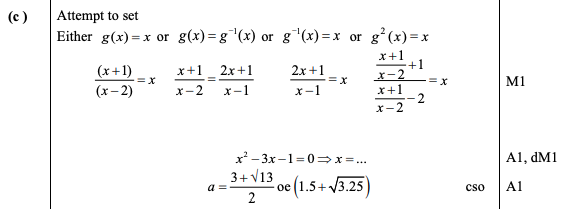
It has not an inverse



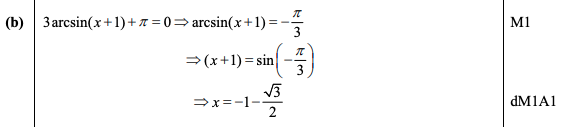
**Question 17**



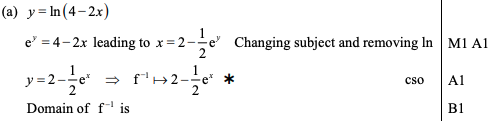
**Question 18**



**Question 19**



**Question 20**

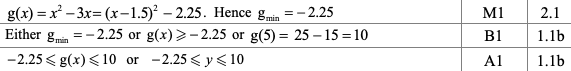


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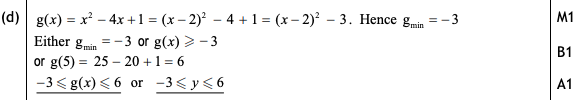
**Question 22**

  or



**Question 23**

  and

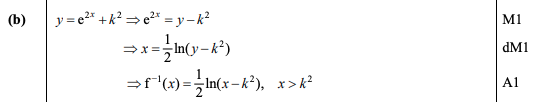


**Question 24**

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**Question 25**

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**Question 26**

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**Question 27**

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**Question 28**

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**Question 29**

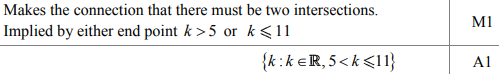
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**Question 30**

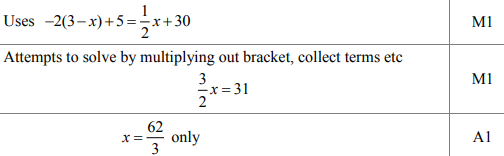
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**Question 31**

  or



**Question 32**



**Question 33**

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**Question 34**

 ,

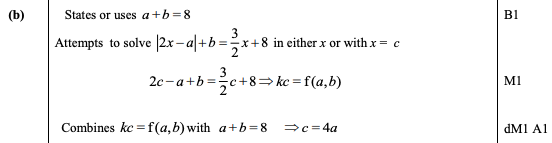


**Question 35**

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**Question 36**



**Question 37**

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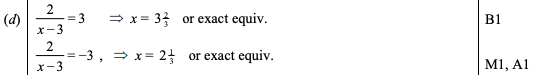
**Question 38**

  or



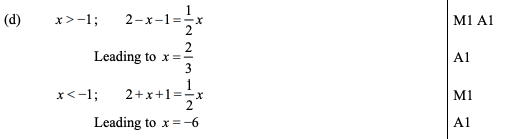
**Question 39**

  or



**Question 40**

  or



**Question 41**

