**GCSE/IGCSE-FM Functions**

**Exercise 1 - Functions**

1. If , find:
2. If , find:

   2. The possible values of such that
   3. The possible values of such that
3. [AQA Worksheet] . Work out when
4. [AQA Worksheet] .  
   If , determine the value of .
5. If , determine the following, simplifying where possible.
6. [AQA IGCSEFM June 2012 Paper 2]   
    for all values of . Solve
7. [AQA Worksheet]   
   Show that
8. If determine:  
   (a)   
   (b)   
   (c)   
   (d)   
   (e) Solve
9. [Edexcel Specimen Papers Set 1, Paper 2H Q18]

Express in the form

* [Senior Kangaroo 2011 Q20] The polynomial is such that   
   and   
  . What is the value of ?

**Exercise 2 – Inverse Functions**

1. Find for the following functions.





8. *[Edexcel IGCSE Jan2016(R)-3H Q16c]*

Find

1. Find for the following functions.

* Find the value of for which is a self inverse function.

**Exercise 3 – Composite Functions**

1. If and , determine:
2. If and determine:
3. If and , find , simplifying your expression.
4. If and and , find the possible values of .
5. If and and , find .
6. Let and .

If , determine the possible values of .

1. Let and .

If , determine the possible values of .

* [Based on MAT question]

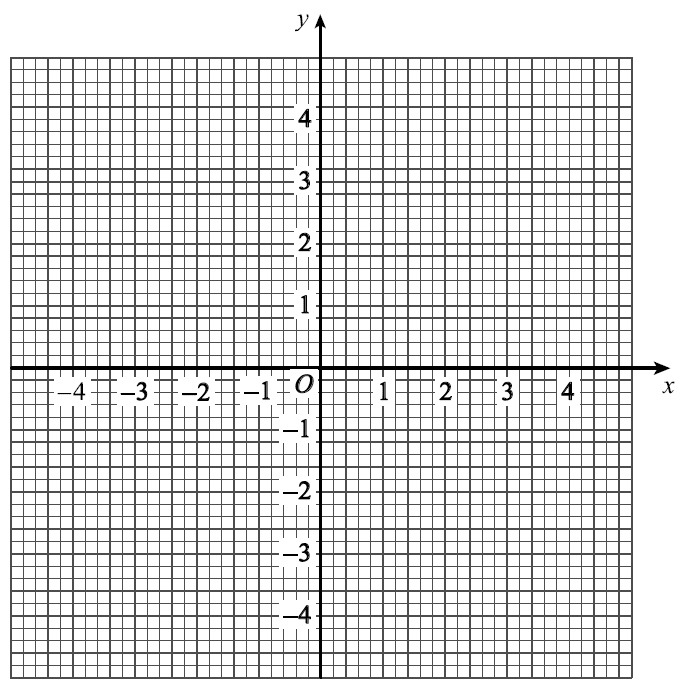
and

Let means that you apply the function times.  
a) Find in terms of and .

b) Note that . Find all other ways of combining and that result in the function .

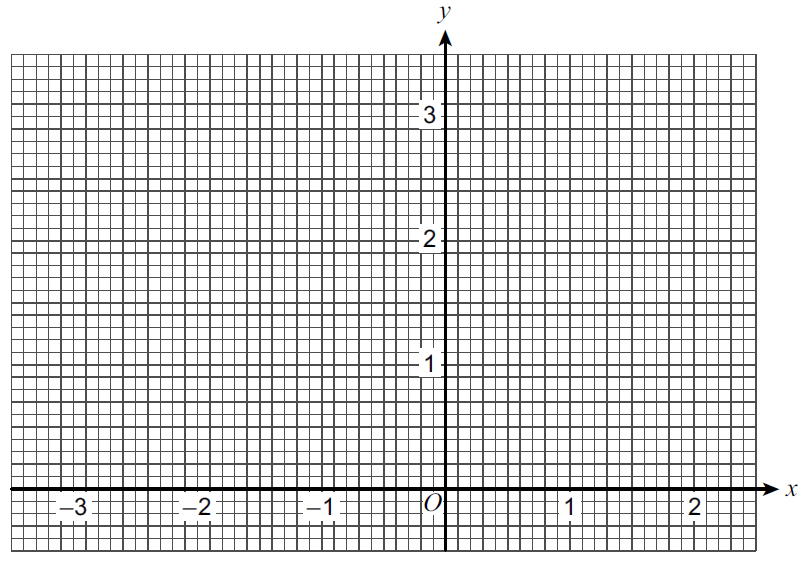
**Exercise 4 – Piecewise Functions**

1. [Jan 2013 Paper 2] A function is defined as:
2. Draw the graph of for



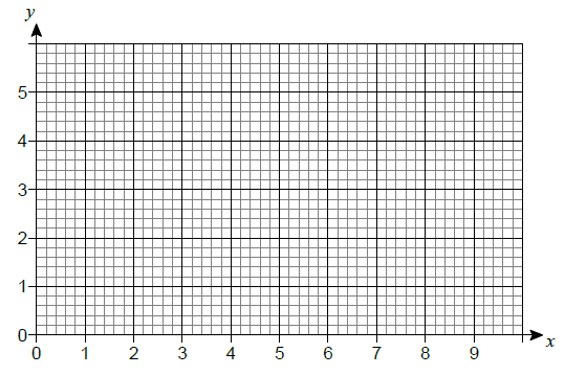
1. Use your graph to write down **how many** solutions there are to
2. Solve
3. [June 2013 Paper 2] A function is defined as:

Draw the graph of for



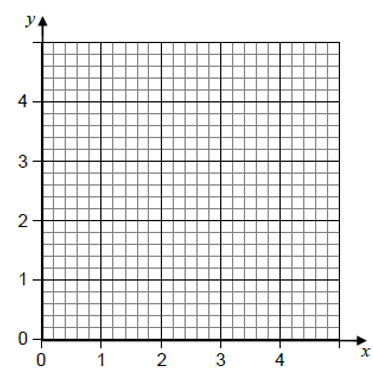
1. [Set 1 Paper 1] A function is defined as:

Draw the graph of for .



1. [Specimen 1 Q4] A function is defined as:

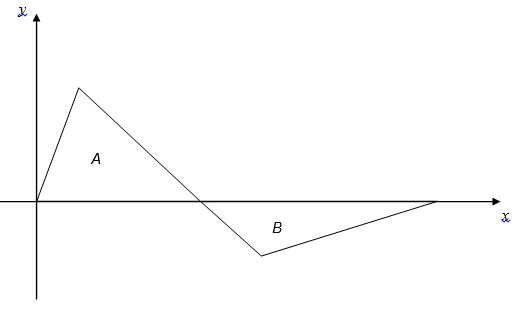
Calculate the area enclosed by the graph of and the axis.



1. [AQA Worksheet Q9]

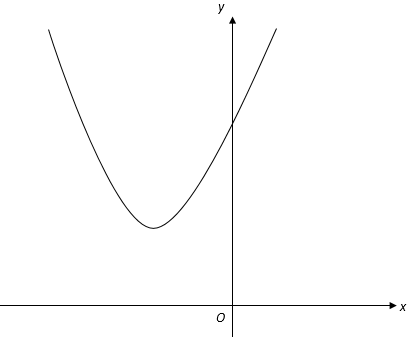
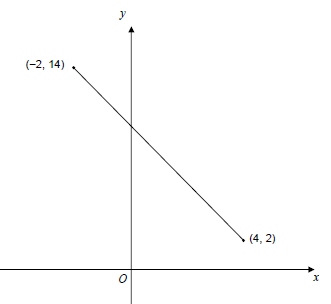
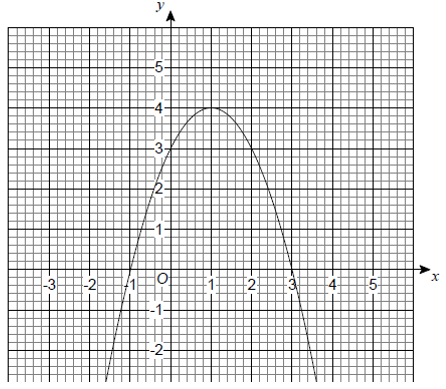
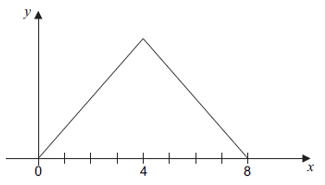
Draw the graph of from .

1. [AQA Worksheet Q10]



Show that

**Exercise 5 – Range/Domain**

1. [AQA Worksheet] Work out the range for each of these functions.  
   (a) for all   
   (b)   
   (c)
2. [AQA Worksheet] (a)   
   Give a reason why is not a suitable domain for .  
   (b) Give a possible domain for
3. The range of is   
   Work out and .
4. [Set 1 Paper 2] (a) The function is defined as:  
   The range of is   
   Work out the value of .  
   (b) The function is defined as  
    for all .  
   (i) Express in the form   
   (ii) Hence write down the range of .
5. [June 2012 Paper 1] for all values of .  
   (a) What is the value of ?  
   (b) What is the range of ?
6. [Jan 2013 Paper 2]  
   (a) What is the range of ?  
   (b) You are given that .  
   Work out the value of .
7. By completing the square or otherwise, determine the range of the following functions:  
   (a) for all   
   (b) for all
8. [AQA Worksheet] Here is a sketch of for all , where is a constant.  
     
     
   The range of is . Work out the value of .
9. [Set 3] The straight line shows a sketch of for the full domain of the function.  
     
   (a) State the domain of the function.  
   (b) Work out the equation of the line.
10. [Set 3] is a quadratic function with domain all real values of . Part of the graph of is shown.  
      
    (a) Write down the range of .  
    (b) Use the graph to find solutions of the equation .  
    (c) Use the graph to solve .
11. [Set 2] The function is defined as:  
    Work out the range of .
12. The function has the domain   
     and is defined as:  
    Work out the range of .
13. [June 2012 Paper 2] A sketch of for domain is shown.  
      
    The graph is symmetrical about . The range of is .  
    Work out the function .

**Exercise 6 – Forming Equations**

Finding a suitable function (for which you may always use a straight line) that matches the following criteria.

1. Domain is . Range . is an increasing function.
2. Domain is . Range .  
    is a decreasing function.
3. Domain is . Range . is an increasing function.
4. Domain is . Range . is a decreasing function.
5. Domain is . Range . is a decreasing function.