**Exercise 2 – Tangents/Normals**

**Question 1**

[IGCSEFM June 2012 Paper 1 Q8] A curve has equation   
(a) When , show that the value of is -7.  
(b) Work out the equation of the tangent to the curve at the point where .

**Question 2**

[IGCSEFM June 2013 Paper Q8] A curve has equation   
(a) Work out .   
(b) Work out the equation of the tangent to the curve at the point where   
Give your answer in the form

**Question 3**

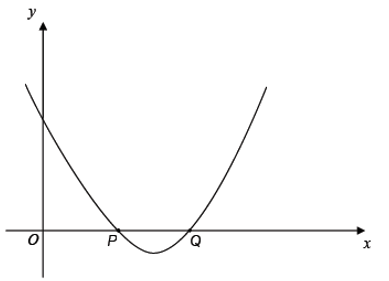
[IGCSEFM Set Paper 1 Q11] Show that the tangents to the curve at and are parallel.

**Question 4**

[IGCSEFM Set 1 Paper 2 Q17] Work out the equation of the normal to the curve at the point (1, 2). Give your answer in the form .

**Question 5**

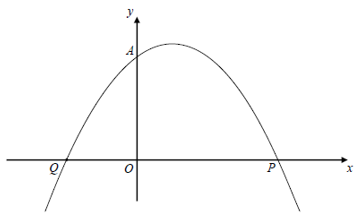
[IGCSEFM Set 2 Paper 1 Q15] The graph shows a sketch of . The curve intersects the -axis at and .



Show that the tangents at and are perpendicular.

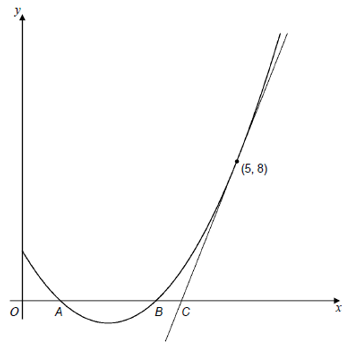
**Question 6**

[IGCSEFM Set 4 Paper 2 Q20] A sketch of the curve is shown.  
 and are points on the curve.



(a) Write down the coordinates of point .  
(b) Show that the normal to the curve at intersects the curve again at .

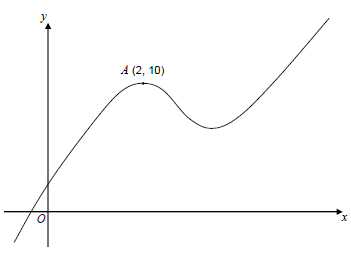
**Question 7**

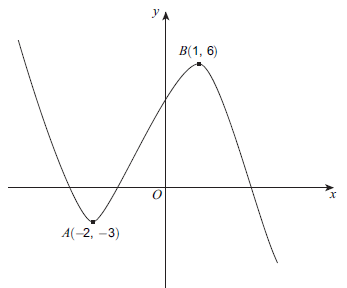


[IGCSEFM Specimen Paper 2 Q22] The diagram shows the graph of   
The curve cuts the -axis at the points and .  
The tangent to the curve at the point (5,8) cuts the -axis at the point .

Show that .

**Exercise 4 – Stationary Points**

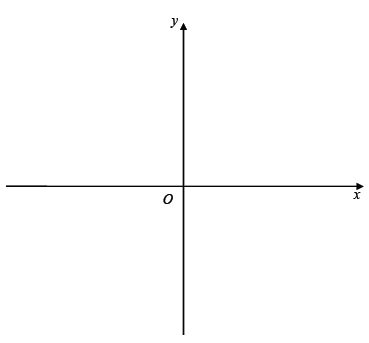
**Question 1**: [Set 4 Paper 2 Q22] A sketch of , where is a cubic function, is shown.  
  
There is a maximum point at .  
(a) Write down the equation of the tangent to the curve at .  
(b) Write down the equation of the normal to the curve at .  
(c) Circle the word that describes the cubic function when .  
 positive negative increasing decreasing

**Question 2**: [June 2013 Paper 2 Q8] A sketch of is shown. There are stationary points at and .  
  
(a) Write down the equation of the tangent to the curve at .  
(b) Write down the equation of the normal to the curve at .  
(c) Circle the range of values of for which is an increasing function.

**Question 3**: [Set 2 Paper 2 Q12] A curve has equation

(a) Work out   
(b) Work out the coordinates of the two stationary points on the curve.

**Question 4**: [Set 1 Paper 2 Q14] (a) Work out the stationary points on the curve .  
(b) Sketch the curve



**Question 5**: [Set 3 Paper 1] A curve has equation   
Work out the coordinates of any stationary points on this curve and determine their nature.

**Question 6**: [Specimen Paper 1 Q13] (a) Work out the coordinates of the stationary point for the curve .  
(b) Explain why has no real solutions.

**Question 7**: [Jan 2013 Paper 1 Q13]   
(a) Work out , giving your answer in the form , where and are integers.  
(b) Hence, or otherwise, work out the coordinates of the stationary point of

(c) Explain how you know that this stationary point is a point of inflection.

**Question 8**: [June 2012 Paper 2 Q23] The curve is such that   
The stationary points of the curve are at and .  
Determine the nature of each stationary point. You **must** show your working.