Equations of tangents and normals -1- polynomials

1Q

Given that $y = x^3 + 2x^2 - 4x + 6$ find $\frac{dy}{dx}$. [1]

P is a point on the curve where $x = -3$.

(a) Calculate the y co-ordinate of P. [1]
(b) Calculate the gradient at P. [2]
(c) Find the equation of the tangent at P. [3]
(d) Find the equation of the normal at P. [3]

2Q

Given that $y = x^3 - x + 8$

(a) find $\frac{dy}{dx}$. [1]

P is a point on the curve where $x = -2$.

(b) Calculate the y co-ordinate of P. [1]
(c) Calculate the value of $\frac{dy}{dx}$ at P. [1]
(d) Find the equation of the tangent at P. [2]

The tangent at Q is parallel to the tangent at P.

(e) Find the co-ordinates of Q. [3]
(f) Find the equation of the normal at Q. [3]

3Q

The line $y = 6x - 5$ intersects with the curve $y = x^2$ at points P and Q. The x co-ordinate of P is less than the x co-ordinate of Q.

(a) Find the co-ordinates of P and Q. [2]
(b) Find the equations of the tangents to the curve $y = x^2$ at both P and Q. [4]
(c) Find the co-ordinates of the point of intersection of these tangents. [3]

4Q

The equation of the curve C is

$$y = x^3 - 3x^2 - 12x - 4.$$

(a) Find $\frac{dy}{dx}$. [2]
(b) Find the co-ordinates of the two points on the curve C where the gradient of the curve is -3. Hence find the equations of the tangents at these points. [6]

5Q

Given the curve $y = x^2 - 4x + 8$,

(a) find the gradient of the curve at the point where $x = 1$. [2]

(b) Find the equation of the normal to the curve at the point where $x = 1$. [3]

(c) Find the co-ordinates of the other point where the normal intersects with the curve. [3]

6Q

The line $y = 2x + 1$ intersects with the curve $y = 3x^2 + 7x - 1$ at points A and B. The x co-ordinate of A is less than the x co-ordinate of B.

(a) Find the co-ordinates of A and B. [3]

(b) Find the equation of the tangent at A. [2]

(c) Find the equation of the normal at B. [3]

7Q

Given that $y = x^3 - x + 6$,

(a) find $\frac{dy}{dx}$. [2]

On the curve representing y, P is the point where $x = -1$.

(b) Calculate the y co-ordinate of the point P. [1]

(c) Calculate the value of $\frac{dy}{dx}$ at P. [1]

(d) Find the equation of the tangent at P. [2]

The tangent at the point Q is parallel to the tangent at P.

(e) Find the co-ordinates of Q. [3]

(f) Find the equation of the normal to the curve at Q. [3]

by permission M.E.I.

8Q

Given the curve

$$y = x^3 - 3x^2 - 4x + 12$$

On the curve representing y, P is the point where $x = -1$.

(a) Find the y co-ordinate of the point P. [1]

(b) Find the gradient of the curve at the point P. [2]

(c) Find the equation of the tangent to the curve at the point P. [3]

(d) Find the equation of the normal to the curve at P. [3]

(e) If the tangent cuts the x axis at the point A and the normal cuts the x axis at the point B, find the area of the triangle ABP. [4]

9Q

Given the curve

$$y = x^2 - 4x + 7$$

(a) find the co-ordinates of the points of intersection of the line $y = 4$ with the curve. [3]

(b) Find the equations of the normal at these points. [6]

(c) Find the co-ordinates of the point where the normals intersect. [3]

10Q

Given the curve

$$y = 8x - x^2 - 12.$$

(a) Find $\frac{dy}{dx}$. [1]

(b) Find the co-ordinates of P, the point of contact of the tangent to the curve, parallel to the line $y = 2x + 5$. Hence find the equation of this tangent. [5]

(c) Find the equation of the normal through the same point of contact. [3]

(d) If the tangent cuts the x axis at A, and the normal cuts the x axis at B, find the area of the triangle APB. [4]