10 $f(x) = 6x - x^2$ $x \in \mathbb{R}$

Given that $f(x)$ can be written in the form $D(x + E)^2 + F$ where D, E and F are integers,

(a) find the value of D, the value of E and the value of F.

(3)

(b) Find

   (i) the maximum value of $f(x)$,

   (ii) the value of x for which the maximum occurs.

(2)

The curve C has equation $y = f(x)$

The curve S has equation $y = x^2 - 4x + 8$

The curve S intersects the curve C at two points.

(c) Find the coordinates of each of these two points.

(4)

The finite region R is bounded by the curve C and the curve S.

(d) Use algebraic integration to find the area of R.

(4)

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 13 marks)

11 The points A and B have coordinates $(-1, 3)$ and $(5, 6)$ respectively.

(a) Find an equation for the line AB.

(2)

The point P divides AB in the ratio $2:1$

(b) Show that the coordinates of P are $(3, 5)$

(2)

The point C with coordinates (m, n), where $m > 0$, is such that CP is perpendicular to the line AB.

Given that the radius of the circle which passes through A, P and C is 5

(c) find the value of m and the value of n.

(6)

The point D with coordinates (p, q) is such that the line AD is perpendicular to the line AB and the line DC is parallel to the line AB.

(d) Find the value of p and the value of q.

(3)

(e) Find the area of trapezium $ABCD$.

(4)

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Question 11 continued

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(Total for Question 11 is 17 marks)

TOTAL FOR PAPER IS 100 MARKS