7 (a) Given that k is a constant such that $\dfrac{27^{(x+2)} - 3^{(3x+5)}}{3^x \times 9^{(x+2)}} = k$

find the value of k.

(5)

(b) Find the exact roots of the equation $2\log_2 y + 3\log_y 2 = 7$

(6)

Question 7 continued

Question 7 continued

Question 7 continued

(Total for Question 7 is 11 marks)

8 [In this question, **p** and **q** are non-zero and non-parallel vectors.]

O, *A*, *B* and *C* are fixed points such that

$$\overrightarrow{OA} = 5\mathbf{p} - 3\mathbf{q} \qquad \overrightarrow{OB} = 11\mathbf{p} \qquad \overrightarrow{OC} = 13\mathbf{p} + \mathbf{q}$$

(a) (i) Show that the points *A*, *B* and *C* are collinear.

(ii) Write down the ratio *AB*:*BC*.

(4)

The midpoint of *OA* is *M* and the midpoint of *OB* is *N*.

(b) Show that the ratio of the area of the quadrilateral *ABNM* to the area of the triangle *OAC* is 9:16

(7)

Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 11 marks)