10 The sum of the second and third terms of a convergent geometric series is 7.5

The sum to infinity, S, of the series is 20

The common ratio of the series is r.

(a) Show that r is a root of the equation

$$8r^3 - 8r + 3 = 0$$

(4)

(b) Show that $r = \frac{1}{2}$ is a root of this equation.

(1)

Given that $r < 0.6$

(c) show that $\frac{1}{2}$ is the only possible value of r.

(4)

(d) Find the first term of the series.

(2)

The sum of the first n terms of the series is S_n

(e) Find the least value of n for which S_n exceeds 99% of S.

(6)

Question 10 continued

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 17 marks)

TOTAL FOR PAPER IS 100 MARKS