3. The sequence $u_1, u_2, u_3, \ldots$ satisfies

$$u_1 = 5 \qquad u_{n+1} = \frac{3}{2}u_n - \frac{1}{2}u_n^2 + 4$$

(a) Show that this sequence is periodic, stating its period.

(3)

(b) State the value of u_{200}

(1)

(c) Find, showing all steps of your working, the value of

$$\sum_{r=1}^{200} u_r$$

(3)

(Total for Question 3 is 7 marks)

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4. **In this question you must show all stages of your working.**
Solutions relying on calculator technology are not acceptable.

The curve C has equation

$$y = 2x^3 + 7x + \frac{3}{x}$$

(a) Find the exact values of the x coordinates of the stationary points of C.

(4)

(b) Hence find the exact range of values of x for which C is increasing.

(2)

(Total for Question 4 is 6 marks)

5. The table below gives some x and y values for a function, $y = f(x)$.

The y values are given to 4 significant figures.

x	3	3.25	3.5	3.75	4	4.25	4.5
y	5.389	6.231	6.815	7.028	6.901	6.732	6.469

(a) Use the trapezium rule with all the y values in the table to find an estimate for

$$\int_3^{4.5} f(x)\,dx$$

giving the answer to 3 significant figures.

(3)

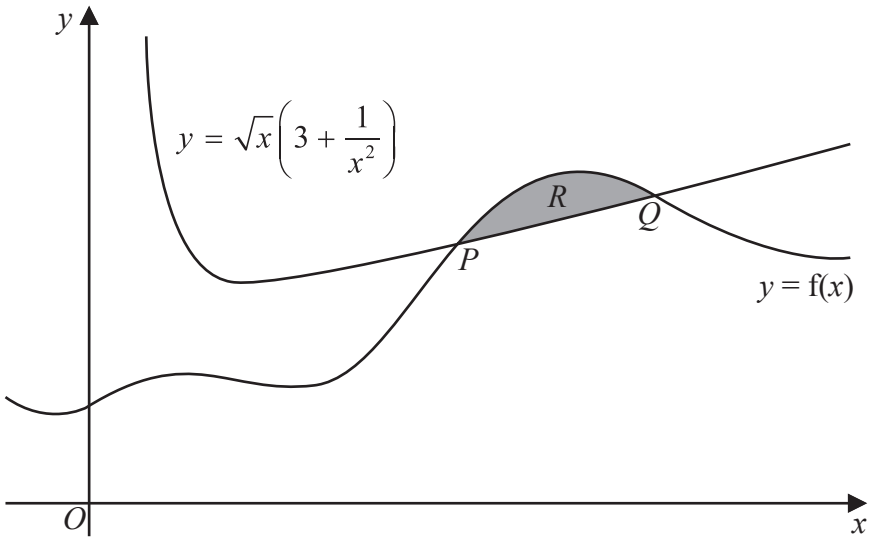


Figure 1

Figure 1 shows a sketch of the curve with equation $y = f(x)$ and the curve with equation $y = \sqrt{x}\left(3 + \frac{1}{x^2}\right)$

The finite region R, shown shaded in Figure 1, is bounded by both curves.

(b) Find

$$\int \sqrt{x}\left(3 + \frac{1}{x^2}\right) dx$$

(3)

The curves intersect at the points P and Q with x coordinates 3 and 4.5 respectively, as shown in Figure 1.

(c) Use the answer to part (a) and the answer to part (b) to find an estimate for the area of R. Give the answer to 2 significant figures.

(2)

(Total for Question 5 is 8 marks)