5. Find

$$\int \frac{4\sqrt{x} - 3}{2x^2} \mathrm{d}x \qquad x > 0$$

writing the answer in its simplest form.

(5)

(Total for Question 5 is 5 marks)

---

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

The equation

$$k(3x^2 + 8x + 9) = 2 - 6x$$

where k is a real constant, has no real roots.

Find the range of possible values for k.

(7)

(Total for Question 6 is 7 marks)

7.

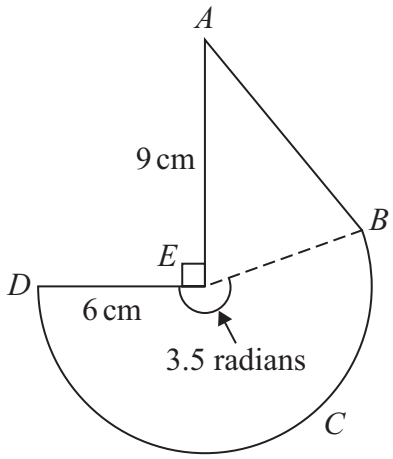


Diagram not drawn to scale

Figure 3

In this question you must show detailed reasoning.

Figure 3 shows the design for a company logo.

The design consists of a triangle *ABE* joined to a sector *BCDE* of a circle with radius 6 cm and centre *E*.
The line *AE* is perpendicular to the line *DE* and the length of *AE* is 9 cm.

The size of angle *DEB* is 3.5 radians, as shown in Figure 3.

(a) Find the length of the arc *BCD*.

(2)

Find, to one decimal place,

(b) the perimeter of the logo,

(3)

(c) the area of the logo.

(4)

(Total for Question 7 is 9 marks)