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

Use the substitution $u = 3 + \cos\theta$ to show that

$$\int_0^{\frac{\pi}{2}} \frac{\sin 2\theta}{\sqrt{3 + \cos\theta}} \, \mathrm{d}\theta = a\sqrt{3} + b$$

where a and b are constants to be found.

(7)

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Question 6 continued

(Total for Question 6 is 7 marks)

7.

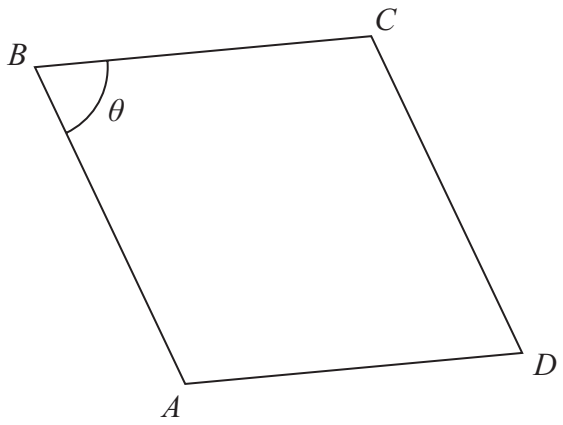

Figure 2

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

Figure 2 shows a sketch of a parallelogram $ABCD$.

Given that

- $\overrightarrow{AB} = 6\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$
- $\overrightarrow{BC} = -4\mathbf{i} + 3\mathbf{j} - 5\mathbf{k}$
- angle $ABC = \theta$, $0 < \theta < 90°$

(a) find the exact value of $\cos\theta$, giving your answer in simplest form.

(3)

(b) Show that the area of parallelogram $ABCD$ is $5\sqrt{k}$, where k is an integer to be found.

(3)

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