**5.** **In this question you must show all stages of your working.**

**Solutions relying on calculator technology are not acceptable.**

(a) Use the substitution $x = 2\sin u$ to show that

$$\int_0^1 \frac{3x+2}{(4-x^2)^{\frac{3}{2}}}\,\mathrm{d}x = \int_0^p \left(\frac{3}{2}\sec u\tan u + \frac{1}{2}\sec^2 u\right)\mathrm{d}u$$

where $p$ is a constant to be found.

**(4)**

(b) Hence find the exact value of

$$\int_0^1 \frac{3x+2}{(4-x^2)^{\frac{3}{2}}}\,\mathrm{d}x$$

**(4)**

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

**Question 5 continued**

**Question 5 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**Question 5 continued**

**(Total for Question 5 is 8 marks)**

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

**6.** Relative to a fixed origin $O$,

- the point $A$ has position vector $\mathbf{i} - 4\mathbf{j} + 3\mathbf{k}$
- the point $B$ has position vector $5\mathbf{i} + 3\mathbf{j} - 2\mathbf{k}$
- the point $C$ has position vector $3\mathbf{i} + p\mathbf{j} - \mathbf{k}$

where $p$ is a constant.

The line $l$ passes through $A$ and $B$.

(a) Find a vector equation for the line $l$

**(3)**

Given that $\overrightarrow{AC}$ is perpendicular to $l$

(b) find the value of $p$

**(3)**

(c) Hence find the area of triangle $ABC$, giving your answer as a surd in simplest form.

**(3)**

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA