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

(i) (a) Divide $(x^2 - 3x + 6)$ by $(x + 2)$

(2)

(b) Hence find $\int \frac{x^2 - 3x + 6}{x + 2} \, dx$

(3)

(ii) Using algebraic integration, find the exact value of

$$\int_0^{\frac{\pi}{6}} \left(\cos\theta - \sin\theta\right)^2 \, d\theta$$

(5)

(Total for Question 3 is 10 marks)

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4. Given that

$$y = 8\tan(2x) \qquad -\frac{\pi}{4} < x < \frac{\pi}{4}$$

show that

$$\frac{dx}{dy} = \frac{A}{B + y^2}$$

where A and B are integers to be found.

(4)

(Total for Question 4 is 4 marks)

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

(a) Show that

$$\frac{\cot^2 x}{1 + \cot^2 x} \equiv \cos^2 x$$

(3)

(b) Hence solve, for $0 \leqslant x < 360°$

$$\frac{\cot^2 x}{1 + \cot^2 x} = 8\cos 2x + 2\cos x$$

Give each solution in degrees to one decimal place.

(5)

(Total for Question 5 is 8 marks)