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

The curve C has equation

$$y = \frac{3x - 2}{(x - 2)^2} \qquad x \neq 2$$

The point P on C has x coordinate 4

Find an equation of the normal to C at the point P in the form $ax + by + c = 0$, where a, b and c are integers.

(6)

(Total for Question 1 is 6 marks)

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2. Given that

$$\mathrm{f}(x) = \frac{4}{3x+5} \qquad x > 0$$

$$\mathrm{g}(x) = \frac{1}{x} \qquad x > 0$$

(a) state the range of f,

(2)

(b) find f^{-1}

(3)

(c) find $\mathrm{fg}(x)$.

(1)

(d) Show that the equation $\mathrm{fg}(x) = \mathrm{gf}(x)$ has no real solutions.

(4)

(Total for Question 2 is 10 marks)

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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)