3. $$g(x) = \frac{x^4 + x^3 - 7x^2 + 8x - 48}{x^2 + x - 12} \qquad x > 3 \qquad x \in \mathbb{R}$$

(a) Given that

$$\frac{x^4 + x^3 - 7x^2 + 8x - 48}{x^2 + x - 12} \equiv x^2 + A + \frac{B}{x - 3}$$

find the values of the constants A and B.

(4)

(b) Hence, or otherwise, find the equation of the tangent to the curve with equation $y = g(x)$ at the point where $x = 4$. Give your answer in the form $y = mx + c$, where m and c are constants to be determined.

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

(5)

(Total for Question 3 is 9 marks)

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4. A curve has equation

$$y = \ln(1 - \cos 2x) \qquad x \in \mathbb{R} \qquad 0 < x < \pi$$

Show that

(a) $\frac{dy}{dx} = k \cot x$, where k is a constant to be found.

(4)

Hence find the exact coordinates of the point on the curve where

(b) $\frac{dy}{dx} = 2\sqrt{3}$

(4)

(Total for Question 4 is 8 marks)

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

(a) Prove that

$$2\operatorname{cosec} 2A - \cot A \equiv \tan A \qquad A \neq \frac{n\pi}{2} \qquad n \in \mathbb{Z}$$

(4)

(b) Hence solve, for $0 \leqslant \theta \leqslant \frac{\pi}{2}$

(i) $2\operatorname{cosec} 4\theta - \cot 2\theta = \sqrt{3}$

(ii) $\tan\theta + \cot\theta = 5$

Give your answers to 3 significant figures.

(5)

(Total for Question 5 is 9 marks)