9 **(a)** The first three terms of an arithmetic progression are $-3\tan\frac{\theta}{2}$, $-\tan\frac{\theta}{2}$, $\tan\frac{\theta}{2}$, where $0 < \theta < \frac{\pi}{2}$.

(i) Given that the 12th term of this progression is equal to $\frac{19\sqrt{3}}{3}$, find the exact value of θ. [4]

(ii) Hence find the exact value of the sum to ten terms of this progression. [2]

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(b) The first three terms of a geometric progression are $\frac{1}{16}\text{cosec}^4\phi$, $\frac{1}{4}\text{cosec}^2\phi$, 1, where $-\frac{\pi}{2} < \phi < \frac{\pi}{2}$.

(i) Given that the sum of the 3rd and 4th terms of this progression is equal to 4, find the possible values of ϕ. [4]

(ii) Determine whether or not this progression has a sum to infinity. [2]

Question 10 is printed on the next page.

10 **(a)** Given that $y = \dfrac{\sqrt{3x^2 - 2}}{x - 4}$, show that $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ can be written in the form $\dfrac{Ax + B}{(x-4)^2\sqrt{3x^2 - 2}}$, where A and B are integers to be found. [5]

(b) Hence find, in terms of h, the approximate change in y when x increases from 3 to $3 + h$, where h is small. [3]

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