8 **(a)** **(i)** Show that $\dfrac{1}{(1+\operatorname{cosec}\theta)(\sin\theta-\sin^2\theta)} = \sec^2\theta$. [4]

(ii) Hence solve $(1+\operatorname{cosec}\theta)(\sin\theta-\sin^2\theta) = \dfrac{3}{4}$ for $-180° \leqslant \theta \leqslant 180°$. [4]

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(b) Solve $\sin\left(3\phi + \frac{2\pi}{3}\right) = \cos\left(3\phi + \frac{2\pi}{3}\right)$ for $0 \leqslant \phi \leqslant \frac{2\pi}{3}$ radians, giving your answers in terms of π. [4]

9 **(a)** Given that $\int_1^a \left(\frac{1}{x} - \frac{1}{2x+3}\right) \mathrm{d}x = \ln 3$, where $a > 0$, find the exact value of a, giving your answer in simplest surd form. [6]

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