3 Solve the equation $\cot^2\left(2x-\frac{\pi}{3}\right)=\frac{1}{3}$, where x is in radians and $0 \leqslant x < \pi$. [5]

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4 **(a)** Find the first three terms, in ascending powers of x^2, in the expansion of $\left(\frac{1}{2}-\frac{2}{3}x^2\right)^8$. Write your coefficients as rational numbers. [3]

(b) Find the coefficient of x^2 in the expansion of $\left(\frac{1}{2}-\frac{2}{3}x^2\right)^8\left(2x+\frac{1}{x}\right)^2$. [3]