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

$$z_1 = \frac{1}{2}\left(\cos\frac{4\pi}{5} + \mathrm{i}\sin\frac{4\pi}{5}\right) \qquad z_2 = \sqrt{3} - 3\mathrm{i}$$

(a) Giving the answers in the form $re^{i\theta}$ where $-\pi < \theta \leqslant \pi$, determine the exact values of

(i) $\dfrac{1}{(z_1)^3}$

(ii) $\dfrac{48z_1}{z_2}$

(6)

(b) Determine the exact values of z for which

$$z^2 = z_1$$

Give the answers in the form $r(\cos\theta + \mathrm{i}\sin\theta)$ where $-\pi < \theta \leqslant \pi$

(3)

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Question 1 continued

(Total for Question 1 is 9 marks)