Quiz 6 Solution

1. (12 points) Write $8\sqrt{3} - 8i$ in polar form; identify $r$ and $0 \leq \theta < 2\pi$ explicitly.

Solution: $r = \sqrt{(8\sqrt{3})^2 + (-8)^2} = 8\sqrt{3} + 1 = 16$ (4 points). Therefore the polar form of $8\sqrt{3} - 8i$ is $8\sqrt{3} - 8i = 16\left(\frac{\sqrt{3}}{2} - \frac{1}{2}i\right)$ (4 points) which means that $\theta = \frac{11\pi}{6}$ (4 points).

2. (8 points) Find all the fourth roots of $8\sqrt{3} - 8i$. In light of the first problem, the fourth roots of $8 + (8\sqrt{3})i$ are

$$2 \left(\cos\left(\frac{11\pi}{6} + \frac{2\pi n}{4}\right) + i \sin\left(\frac{11\pi}{6} + \frac{2\pi n}{4}\right)\right)$$ (6 points),

where $n = 0, 1, 2, 3$ (2 points).