

Name (print) \_\_\_\_\_ Tu/Th Discussion (circle) 12 1 2

\*\*\*\*\* If you use a calculator it must be your own. You must show your work. \*\*\*\*\*

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

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

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