

$$54\sqrt{2} - 54i\sqrt{2} - 54i\sqrt{3}\sqrt{2} - 54\sqrt{3}\sqrt{2}$$

$$= 54\sqrt{2} - 54\sqrt{6} - (54\sqrt{2} + 54\sqrt{6})i$$

$$z_1 = 27 \left(\cos\left(\frac{2\pi}{3}\right) + i \sin\left(\frac{2\pi}{3}\right) \right) \quad \frac{8+9}{12} \pi$$

$$z_2 = 8 \left(\cos\left(\frac{3\pi}{4}\right) + i \sin\left(\frac{3\pi}{4}\right) \right)$$

$$z_1 z_2 = 216 \left(\cos\left(\frac{17\pi}{12}\right) + i \sin\left(\frac{17\pi}{12}\right) \right)$$

$$\stackrel{?}{=} 54\sqrt{2} - 54\sqrt{6} - (54\sqrt{2} + 54\sqrt{6})i$$

$$\cos \frac{17\pi}{12} = \cos\left(\frac{2\pi}{3} + \frac{3\pi}{4}\right)$$

$$= \cos \frac{2\pi}{3} \cos \frac{3\pi}{4} - \sin \frac{2\pi}{3} \sin \frac{3\pi}{4}$$

$$= \left(-\frac{1}{2}\right)\left(-\frac{1}{\sqrt{2}}\right) - \left(\frac{\sqrt{3}}{2}\right)\left(\frac{1}{\sqrt{2}}\right) = \frac{1-\sqrt{3}}{2\sqrt{2}} = \frac{\sqrt{2}-\sqrt{6}}{4}$$

$$216 \left(\frac{\sqrt{2}-\sqrt{6}}{4} \right) = 54\sqrt{2} - 54\sqrt{6}$$

$$54\sqrt{2} - 54\sqrt{6} - (54\sqrt{2} + 54\sqrt{6})i$$

$$\sin \frac{17\pi}{12} = \sin \frac{2\pi}{3} \cos \frac{3\pi}{4} + \sin \frac{3\pi}{4} \cos \frac{2\pi}{3}$$

$$= \left(\frac{\sqrt{3}}{2}\right)\left(-\frac{1}{\sqrt{2}}\right) + \left(\frac{1}{\sqrt{2}}\right)\left(-\frac{1}{2}\right)$$

$$= \frac{-\sqrt{3}}{2\sqrt{2}} - \frac{1}{2\sqrt{2}} = \frac{\sqrt{6}-\sqrt{2}}{4}$$

$$216 \left(\frac{-\sqrt{6}-\sqrt{2}}{4} \right) = -54\sqrt{6} - 54\sqrt{2}$$

$$= -(54\sqrt{6} + 54\sqrt{2}) \quad \checkmark$$

So it checks out for z_1, z_2

$$z_1 = 27 \left(\cos \frac{2\pi}{3} + i \sin \frac{2\pi}{3} \right) = 27 \left(-\frac{1}{2} + \frac{\sqrt{3}}{2} i \right) \\ = -\frac{27}{2} + \frac{27\sqrt{3}}{2} i$$

$$z_2 = 8 \left(\cos \frac{3\pi}{4} + i \sin \frac{3\pi}{4} \right) = 8 \left(-\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} i \right) \\ = -\frac{8}{\sqrt{2}} + \frac{8}{\sqrt{2}} i = -\frac{8\sqrt{2}}{2} + \frac{8\sqrt{2}}{2} i$$

$$z_1 z_2 = \left(-\frac{27}{2} + \frac{27\sqrt{3}}{2} i \right) \left(-\frac{8\sqrt{2}}{2} + \frac{8\sqrt{2}}{2} i \right)$$

$$= \underline{54\sqrt{2}} - \underline{54\sqrt{2}i} - 54\sqrt{6}i + \underline{54\sqrt{6}i^2}$$

$$= \underline{54\sqrt{2}} - \underline{54\sqrt{6}} + \left(\underline{-54\sqrt{2}} - 54\sqrt{6} \right) i$$

$$54\sqrt{2} - 54\sqrt{6} - (54\sqrt{2} + 54\sqrt{6}) i$$

$$\sqrt{a^2 + b^2} = a + b \quad \text{Naw!}$$

$$\sqrt{4^2 + 3^2} = 4 + 3 = 7$$

$$\sqrt{25} = 5 = 7 \quad ?!$$