

Full Name: _____

Student No: _____

Grade:

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1. (2 points)

(a) Find the 4th roots of $-8 + 8\sqrt{3}i$ and write them in the form $a + bi$.

(b) Compute the integral $\int_0^\pi (\sin \theta)^2 \cos 2\theta \, d\theta$.

(HINT: Write $\sin$ and $\cos$ in terms of the exponential function and simplify.)

2. (5 points) Let A be the open disk of radius 2 centered at the origin, B the set of points $z \in \mathbb{C}$ such that $|\operatorname{Arg} z| > \pi/6$, and $C := \{z \in \mathbb{C} : \operatorname{Re} z \geq 1\}$. Let D be the intersection of A and B , and let E be the intersection of C and D .

- (a) Sketch the three sets A , B , and C on the complex plane and clarify the boundary points.

- (b) Is D a domain?

(A *domain* is a set that is both open and connected.)

Answer:

- (c) Is E a region?

(A *region* is a domain together with some, none or all of its boundary points.)

Answer:

3. (3 points) Show (by means of a geometric or algebraic argument) that if u and v are two distinct points on the unit circle, then the real part of $\frac{u+v}{u-v}$ must be zero.