HOMEWORK ASSIGNMENT #2

due in class on Friday, January 20

Student No: _____ Name (Print): _____

Note: All homework assignments are due in class one week after being assigned. They must be on standard $8\frac{1}{2} \times 11$ size paper and they must be stapled. Assignments which are not stapled will not be accepted. I will not bring a stapler to class. Please enter your student number and name (as it appears on the registrar's list) in the spaces above. SURNAME FIRST IN CAPITALS, and given name second. Please put your answers in the boxes (if provided), show any work in the spaces provided and submit these pages for your assignment.

1. Find all n^{th} roots of the following complex numbers z. Express your answers in the form $a + bi$.

(a) $n = 3,\ z = -8i$.

(b) $n = 4,\ z = -2 + \sqrt{12}i$.

2. Find all complex numbers z satisfying the following equations.
(a) $e^z = \imath$.

(b) $\cos z = 2$.

3. Use De Moivre's formula to prove that $\cos 4\theta = 8\cos^4\theta - 8\cos^2\theta + 1 \;\forall\; \theta$.

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4. For any 2 complex numbers z_1, z_2 show that $|z_2| - |z_1| \leq |z_2 - z_1|$.

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5. Solve for $z : z^3 = \dfrac{2\imath}{1+\imath}$.

6. Sketch each of the following sets Ω. If Ω is open (resp. closed or connected) put the words open (resp. closed or connected) in the boxes; otherwise leave blank.

(a) $\Omega = \{z = x + \imath y \mid \ x \geq 1 \text{ or } x \leq 0\}$

(b) $\Omega = \mathbb{C} - \{z \mid 0 \leq x \leq 1, y = 0\}$

(c) $\Omega = \{z \mid 1 < |z| < 2\}$

(d) $\Omega = \{z \mid x^2 - xy + y^2 \leq 1\}$

(e) $\Omega = \{z \mid -1/2 \leq x \leq 1/2 \text{ and } |z| \geq 1\}$

(f) $\Omega = \{z = re^{\imath\theta} \mid r > 0 \text{ and } \pi/4 \leq \theta \leq \pi/2\}$

(g) $\Omega = \mathbb{C} - \{z \mid 0 \leq x, y = 0\}$