King Fahd University of Petroleum & Minerals
Department of Mathematics & Statistics
Math 430 Major Exam I
The Second Semester of 2016-2017 (162)
Time Allowed: 90 Minutes

Name: _____ ID#: _____

Section/Instructor: _____ Serial #: _____

- Mobiles and calculators are not allowed in this exam.
- Provide all necessary steps required in the solution.

Question #	Marks	Maximum Marks
1		15
2		12
3		11
4		12
Total		50

1 (15 points) (a) Verify that $\sqrt{2}\ \ |z| \geq |Re\ z| + |Im\ z|$.

(b) Sketch the set of points determined by $|z - i| = \text{Im z} + 1$.

(c) Express $\dfrac{1+i}{\sqrt{3}-i}$ in terms of rectangular and polar forms.

(2) (12 points) (a) Show that the all values of $f(z) = \frac{z}{1-z^2}$ lies on the y-axis.

(b) If z is a complex number satisfying $|z|^2 - |z| - 2 < 0$, then find the value of $|z^2 + z\ \sin\theta|$ for all values of θ.

(3) (11 points) (a) Find the roots of $(-16)^{\frac{1}{4}}$ and locate them graphically.

(b) Define " Domain and open set " in the complex plane.

(c) Is the set $0 < |z - 2| < 3$ a domain and open set? Give reason.

(4) (12 points) (a) Use $\epsilon - \delta$ definition to show that $\lim_{z\to 1}\ \dfrac{i\ \bar{z}}{2} = \dfrac{i}{2}$

(b) State the Cauchy-Riemann equations for a differentiable function $f(z)$ at point z_0.

(c) Let $f(z) = \dfrac{1}{z^2}\quad (z \neq 0)$. Use the Cauchy-Riemann equations in polar coordinates to find $f'(z)$.