RUTGERS
UNIVERSITY | NEWARK

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Complex variables

Fall 2016

Quiz #4

Monday, October 17 2016

NAME: _____

Please write clearly and properly.

Problem	**Grade**
1	
2	
Total	

Problem 1 (~ 4 points.)**.**

True or false? *No explanation is required.*

(1) The image of an open set by a continuous function is open.

(2) The image of a closed set by a continuous function is closed.

(3) The image of a compact set by a continuous function is compact.

(4) The image of a bounded set by a continuous function is bounded.

(5) The image of a connected set by a continuous function is connected.

(6) The image of a convex set by a continuous function is convex.

(7) The image of a simply connected set by a continuous function is simply connected.

(8) The image of a finite set by a continuous function is finite.

Hint: Counter-examples to some of the statements above are provided by $f(A)$ *where:*

- f *is the exponential function and* $A = \mathbb{C}$.
- f *is the function* $z \mapsto 1/z$ *and* $A = D^*(0,1) = D(0,1) \setminus \{0\}$.
- f *is the function* $z \mapsto 1/(1+|z|)$ *and* $A = \mathbb{C}$.

Problem 2 (~ 4 points.)**.**

True or false? *No explanation is required.*

(1) The preimage of an open set by a continuous function is open.

(2) The preimage of a closed set by a continuous function is closed.

(3) The preimage of a compact set by a continuous function is compact.

(4) The preimage of a bounded set by a continuous function is bounded.

(5) The preimage of a connected set by a continuous function is connected.

(6) The preimage of a convex set by a continuous function is convex.

(7) The preimage of a simply connected set by a continuous function is simply connected.

(8) The preimage of a finite set by a continuous function is finite.

Hint: Counter-examples to some of the statements above are provided by $f^{-1}(A)$ *where* $f : \mathbb{C} \to \mathbb{C}$ *is the exponential function and* $A = \{1\}$.