

## Quiz #6

Monday, October 31 2016

**Duration: 20 min**

**NAME:** \_\_\_\_\_

**Please write clearly and properly. Always explain your answers.**

<b>Problem</b>	<b>Grade</b>
<b>1</b>	
<b>2</b>	
<b>Total</b>	

**Problem 1** (~ 2 points.).

Give an example of a rational fraction whose zeroes are  $1 - i$  and  $-1$ , both with multiplicity 1, and whose only pole is  $i$ , with multiplicity 2.

**Problem 2** (~ 8 points.).

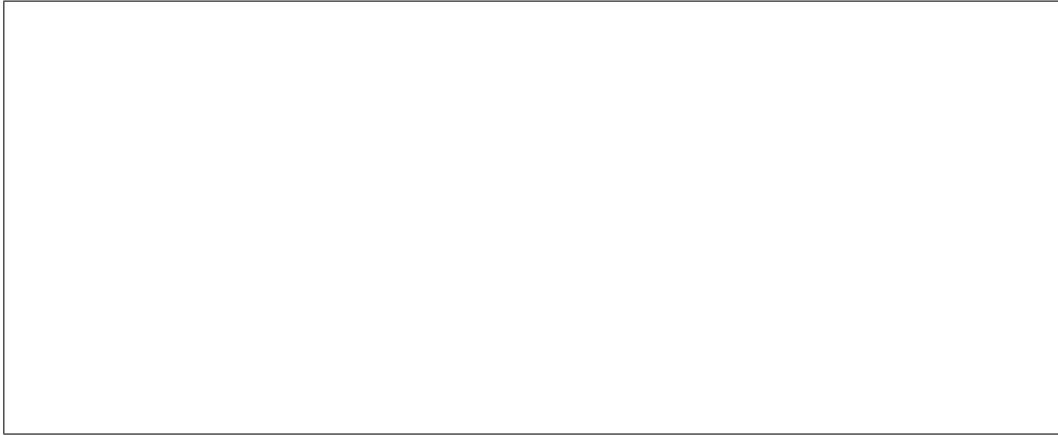
Consider the following function:

$$f: \mathbb{C} \rightarrow \mathbb{C}$$
$$z \mapsto z^3 - 2z^2 + z$$

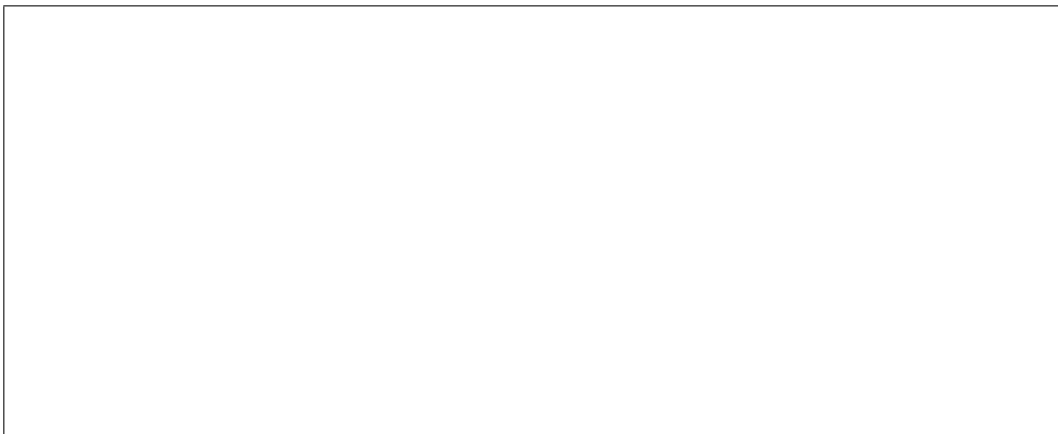
(1) What kind of function is  $f$ ?

(2) Compute all the successive derivatives of  $f$ .

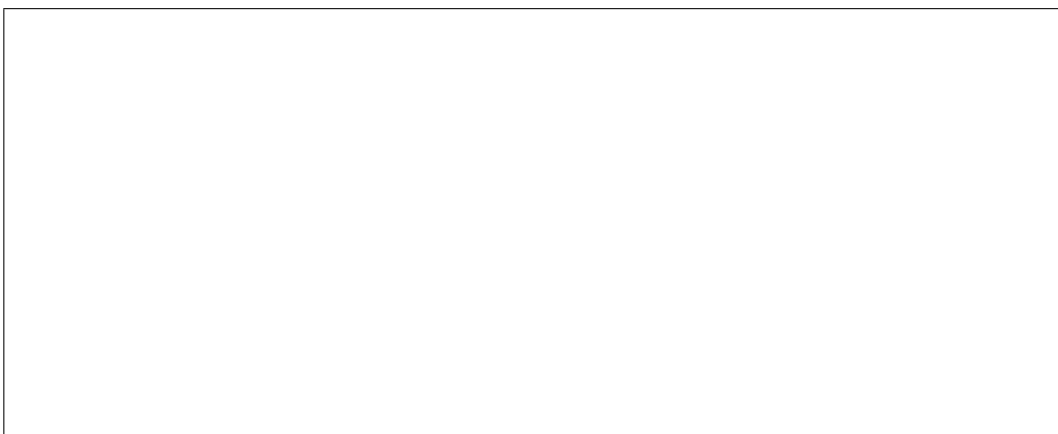
(3) Is  $z = 0$  a root of  $f$ ? Is it a root of  $f'$ ? What is the multiplicity of  $z = 0$  as a root of  $f$ ?



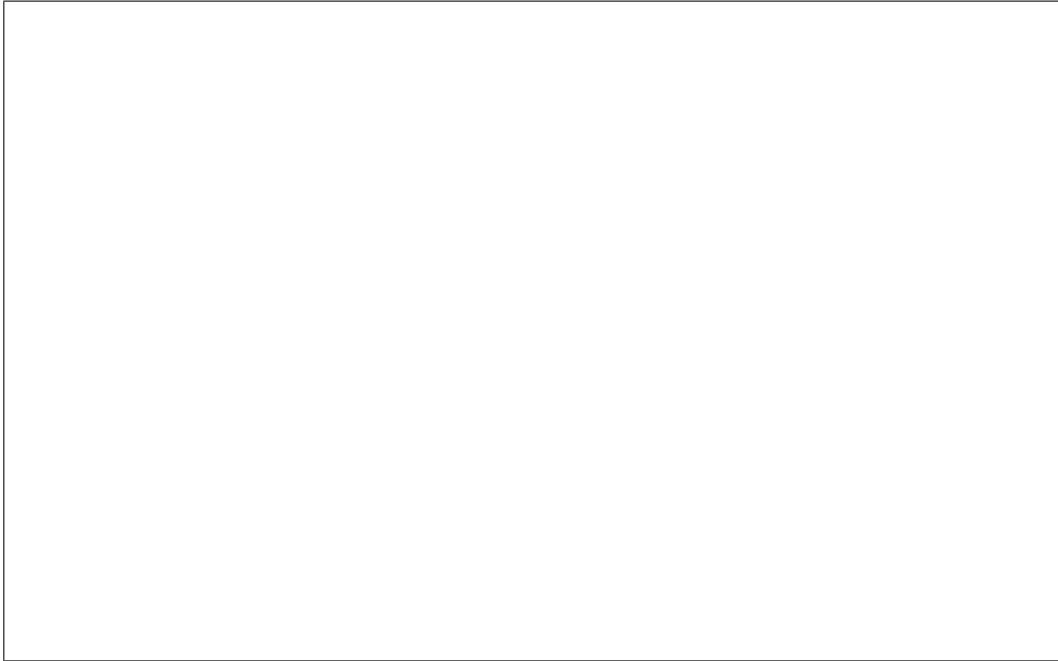
(4) Is  $z = 1$  a root of  $f$ ? Find its multiplicity.



(5) Find all the roots of  $f$  and their multiplicities.



(6) Find the Taylor expansion of  $f$  at  $z = 0$ .



(7) Find the Taylor expansion of  $f$  at  $z = 1$ .

