RUTGERS
UNIVERSITY | NEWARK

Math 451
Abstract Algebra I

Fall 2017

Quiz #9

Monday, December 11 2017

Duration: 20 min

NAME: _____

Please write clearly and properly. Justify your answers carefully.

Problem	Grade
1	
2	
3	
Total	

Problem 1 ($\sim$ 4 points)**.**

Consider the polynomials $A \in \mathbb{Q}[x]$ and $B \in \mathbb{Q}[x]$ defined by:

$$A = x^3 - 2x^2 + x + 2$$
$$B = x + 2$$

(1) Compute the Euclidean division of A by B.

(2) Derive the value of $A(-2)$ from the previous question. Check your answer with a direct calculation of $A(-2)$.

Problem 2 ($\sim$ 4 points)**.**

Consider the polynomial $P \in \mathbb{R}[x]$ defined by $P = x^3 - x^2 - 8x + 12$.

(1) Find a root $\alpha \in \mathbb{R}$ of the polynomial P. *Hint: try small integers*.

(2) Write P as a product of polynomials of degree 1. *Hint: start by finding the quotient of P by $x - \alpha$, where α is the root you found in the previous question.*

(3) What are the roots of P? Explain.

Problem 3 ($\sim$ 2 points)**.**

Consider the ring $R = \mathbb{Z}/3\mathbb{Z}$ and the polynomial $P \in \mathbb{R}[x]$ defined by $P = x^5 + 2x$. What are the roots of P? Is P the zero polynomial?