ALGEBRA II
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Homework 1101
Monday, November 1, 2021

Name:

Due Tuesday, November 2, 2021. Write all complex number and polynomials in standard form.

Problem 1. Complete the square to solve the quadratic equation $x^2 - 10x + 30$. Simplify the solutions, and write them in the form $m + \sqrt{n}i$, where m and n are integers. Write the solution set.

Problem 2. Use the quadratic formula to solve the quadratic equation $3x^2 - 7x - 5 = 0$. Write the solution set.

Problem 3. Let $f(x) = x^3 - 7x^2 + 4x - 11$ and $g(x) = x^2 + 3$.

(a) Compute $f(x) + g(x)$.

(b) Compute $f(x) \cdot g(x)$.

(c) Divide $g(x)$ by $f(x)$. Find the quotient and the remainder.

Definition 1. Recall that a polynomial is *monic* if its leading coefficient is 1.

Proposition 1. (Conjugate Pairs Theorem for Quadratics)
Let $f(x)$ be a quadratic function with real coefficients. Suppose $z \in \mathbb{C}$ and $f(z) = 0$. Then $f(\overline{z}) = 0$.

Proposition 2. (Remainder Theorem)
Let $g(x)$ be a polynomial and let $a \in \mathbb{C}$. Suppose that the remainder when $g(x)$ is divided by $x - a$ is r. Then $g(a) = r$.

Problem 4. Write a monic polynomial f with real coefficients and roots -2, 3, and 5.

Problem 5. Write a monic polynomial g with real coefficient such that $g(2 + 3i) = 0$.

Problem 6. Let $a \in \mathbb{R}$ and $f(x) = x - a$. Let g be a polynomial of the fifth degree. Suppose that the remainder when g is divided by f is π. What is $f(a)$? What is $g(a)$?

Problem 7. Let $g(x) = x^5 - 2x^4 + 17x^3 - 2x^2 + 11x - 22$.

(a) What is the remainder when $g(x)$ is divided by $x - 0$? Explain.

(b) What is the remainder when $g(x)$ is divided by $x - 1$? Explain.