Algebra II
PRACTICE Examination 2

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The examination will contain ten problems which are worth 10 points each, and two bonus problems worth ten points each. All answers must be justified. An appropriate amount of work must be shown to receive credit.

The quadratic formula for solutions to $ax^2 + bx + c = 0$ is

$$\boxed{x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.}$$

Problem 1. Integer Division
Given $n = 321$ and $m = 20$, there exist unique integers q and r such that $n = mq + r$ and $0 \leq r < m$. Find q and r.

Problem 2. (Decimal Division)
Find the decimal expansion of $\frac{91}{37}$.

Problem 3. Solving Linear Equations
Solve the equation $8x - 5 = 3x + 41$. Correctly write the solution set.

Problem 4. (Solving Quadratic Equations by Factoring)
Solve the equation $x^2 - 3x = 54$ by factoring. Correctly write the solution set.

Problem 5. (Solving Quadratic Equations by Completing the Square)
Solve the equation $x^2 - 6x - 10 = 0$ by completing the square. Correctly write the solution set.

Problem 6. (Solving Quadratic Equations with the Quadratic Formula)
Use the quadratic formula to find all complex solutions to the equation $7x^2 - 3x + 5 = 0$. Correctly write the solution set.

Problem 7. (Distance and Midpoint)
Consider the points $A = (2, 11)$ and $B = (-10, 5)$.

(a) Let d be the distance from A to B. Find d.

(b) Find the midpoint between A and B. Find M.

Problem 8. (Equation of a Line)
Consider the points $A = (2, 11)$ and $B = (-10, 5)$.

(a) Find the slope of the line through A and B.

(b) Find the point-slope form of the equation of the line through A and B.

(c) Find the slope-intercept form of the equation of the line through A and B.

Problem 9. (Complex Numbers)
Let $x = 1 + 8i$ and $y = 6 - 3i$. Perform the indicated operation. Write the result in the form $a + bi$, where a and b are real.

(a) $x + y$

(b) xy

Problem 10. (Sets of Numbers)
Recall that

$$\mathbb{N} \subset \mathbb{Z} \subset \mathbb{Q} \subset \mathbb{R} \subset \mathbb{C}.$$

Of these sets of numbers, state the smallest set which contains all of the solutions to the given equation. Write the symbol of the appropriate set in the blank next to the equation.

(a) _____ $x - 3 = 0$

(b) _____ $x + 3 = 0$

(c) _____ $3x - 1 = 0$

(d) _____ $x^2 - 3 = 0$

(e) _____ $x^2 + 3 = 0$

(f) _____ $2x - 2 = 3x + 1$

(g) _____ $x = 2 + i$

(h) _____ $x = \dfrac{2i}{3}$

(i) _____ $x = \sqrt{17}$

(j) _____ $x^2 - 6x + 10 = 0$