Name:

Algebra II
PRACTICE Examination 1

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The examination will contain five problems which are worth 20 points each, and two bonus problems worth an additional 10 points each, for a maximum of 100 points.

Problem 1. (Sets of Numbers)
Recall our familiar sets of numbers:

$$\text{Natural Numbers:} \quad \mathbb{N} = \left\{ 1, 2, 3, \dots \right\}$$

$$\text{Integers:} \quad \mathbb{Z} = \left\{ \dots, -2, -1, 0, 1, 2, \dots \right\}$$

$$\text{Rational Numbers:} \quad \mathbb{Q} = \left\{ \frac{p}{q} \,\middle|\, p, q \in \mathbb{Z}, q \neq 0 \right\}$$

$$\text{Real Numbers:} \quad \mathbb{R} = \left\{ \text{ numbers given by decimal expansions } \right\}$$

$$\text{Complex Numbers:} \quad \mathbb{C} = \left\{ a + ib \mid a, b \in \mathbb{R} \text{ and } i^2 = -1 \right\}$$

Note that

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

For each statement, write **T** in the blank if the statement is true, and write **F** in the blank if the statement is false.

(a) _____ $\frac{2}{3} \in \mathbb{Z}$

(b) _____ $3 \notin \mathbb{N}$

(c) _____ $\frac{3}{2} \in \mathbb{Q}$

(d) _____ $-3 \in \mathbb{Q}$

(e) _____ $4 \notin \mathbb{N}$

(f) _____ $0 \in \mathbb{Q}$

(g) _____ $0.1 \notin \mathbb{Z}$

(h) _____ $\frac{-5}{2} \notin \mathbb{Q}$

(i) _____ $\sqrt{2} \notin \mathbb{Q}$

(j) _____ $\sqrt{5} + 2 \in \mathbb{R}$

Problem 2. (Division)
Answer the following questions.

(a) Let $n = 830$ and $m = 13$. Find the quotient q and the remainder r such that $n = mq + r$ and $0 \leq r < m$.

(b) Let $x = \dfrac{13}{7}$. Find the decimal expansion of x.

Problem 3. (Solving Linear Equations)
Solve the linear equation. Simplify the answers.
Correctly write the solution set. Justify your answer. Show all work.

(a) $12x - 11 = 25$

(b) $9x - 10 = 7 - 3x$

Problem 4. (Solving Quadratic Equations)
Solve the quadratic equation using the indicated method.
Correctly write the solution set. Justify your answer. Show all work.

(a) $3x^2 - 5 = 26$ (Extracting Roots)

(b) $x^2 - 7x - 44 = 0$ (Factoring)

Problem 5. (Solving Quadratic Equations)
Solve the quadratic equation using the indicated method.
Correctly write the solution set. Justify your answer. Show all steps.

(a) $x^2 - 12x - 5 = 0$ (Completing the Square)

(b) $3x^2 - x - 7 = x^2 - x + 2$ (Simplify)