Name: _____

**Directions:** Solve the following problems. Give supporting work/justification where appropriate.

1. **[2 parts, 1 point each]** Express the following sets using a list between braces, using the ellipses if necessary.

   (a) $\{3n-1 \colon n \in \mathbb{Z} \text{ and } |n| \leq 3\}$

   (b) $\{(x,y) \colon x, y \in \mathbb{Z} \text{ and } x^2 + y^2 = 1\}$

2. **[4 parts, 1 point each]** Determine whether the following sets are infinite or finite. If the set is finite, then determine its cardinality.

   (a) $\{1, \{1\}, \{\{1\}\}, \{\{\{1\}\}\}, \ldots\}$

   (b) $\{\mathbb{R}\}$

   (c) $\{x \in \mathbb{R} \colon x^2 = 1\}$

   (d) $\{1, 2, 3, \{1,2\}, 1, \{2,1,2\}\}$

3. **[2 parts, 1 point each]** Use set-builder notation to express the following sets compactly.

   (a) $\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \ldots\}$

   (b) The set of all points $(x, y)$ in the interior of the triangle with vertices $(0, 0)$, $(1, 1)$, and $(1, 0)$.

4. **[2 points]** Use set-builder notation to express the subset of $\mathbb{R}^2$ displayed below.