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) $\{\frac{n}{2}\colon\ n \in \mathbb{N}\}$

   (b) $\{(x, y)\colon\ x, y \in \mathbb{Z} \text{ and } x + y = 0\}$

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) $\{\{1, 2, (3, 4)\}\}$

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

   (c) $\{x \in \mathbb{R}\colon\ 0 < x < 1\}$

   (d) $\{\varnothing, \{\}, (0, 1), (1, 0)\}$

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

   (a) $\{1, 2, 4, 8, 16, 32, 64, \ldots\}$

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

4. **[2 parts, 1 point each]** Sketch the following sets of points in the x, y-plane $\mathbb{R}^2$. Use dashes to denote boundaries that are excluded from the set.

   (a) $\{(x, y) \in \mathbb{R}^2 \colon\ 1 \leq x^2 + y^2 < 4\}$

   (b) $\{(x, y) \in \mathbb{R}^2 \colon\ x + y \in \{-1, 1\}\}$