Homework 1 - Math 254 **Name:** _____

Due in class Wednesday, January 26.

1. Rewrite these sets by listing their elements between curly braces.

   (a) $\{x \in \mathbb{Z} : |2x| \leq 6\}$

   (b) $\{5n : n \in \mathbb{N}, n < 4\}$.

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2. Rewrite these sets using set-builder notation.

   (a) $\{7, 8, 9, 10, 11, 12, 13, 14\}$

   (b) $\{-15, -10, -5, 0, 5, 10, 15\}$.

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3. Sketch the following set in the (x, y)-plane: $\{(x, y) : x \in [1, 2), y \in \{1, 2, 3\}\}$.

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4. Find the following cardinalities.

   (a) $|\{n \in \mathbb{N} : n^2 < 10\}|$.

   (b) $|\{\{1, 2\}, \varnothing, 4, 5, \{0, \{0\}\}\}|$.

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5. List all subsets of the following sets.

   (a) $\{a, \varnothing\}$

   (b) $\{1, 2, \{1, 2\}\}$

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6. Let $A = \{2, 3, 4, 5\}$ and $B = \{0, 2, 4, 6, 8, 10, 12\}$ have universal set $U = \{0, 1, 2, \ldots 12\}$. Find:

   (a) $\overline{A} - B$

   (b) $A \cap \overline{B}$

   (c) $\overline{A \cup \overline{B}}$

   (d) $A \times (A - B)$

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7. Write the elements of the following sets by listing their elements between curly braces.

   (a) $\mathcal{P}(\mathcal{P}(\{a\}))$

   (b) $\{S \in \mathcal{P}(\{1, 2, 3\}) : |S| = 2\}$.

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8. Find the following.

   (a) $\bigcup_{n \in \mathbb{N}} [1, n + 2)$

   (b) $\bigcap_{n \in \mathbb{N}} [1, n + 2)$.

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9. Find the following.

   (a) $\bigcup_{k \in \mathbb{Z}} (k, k + 1)$

   (b) $\bigcap_{k \in \mathbb{Z}} (k, k + 1)$

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10. Write the following sets in interval notation:

    (a) $[-2, 5] \cap (-2, 7)$

    (b) $(-2, 7) - [3, 5]$
