**Mathematics 300**

**Quiz 1** **Name:**_____

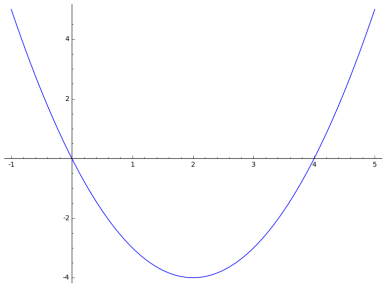
***You must show your work to get full credit.***

**1.** Write the set $S = \{x \in \mathbb{Z} : x(x-4) < 0\}$ as a list of elements between brackets.

*Solution*: If $x \geq 4$ then $x-4 \geq 0$ and so $x(x+4) \geq$. If $x \leq 0$, then also $x-4 \leq 0$ and $x(x-4) \geq 0$ (as negative times negative is negative). The only leaves the integers $x$ with $0 < x < 4$ and you can just check directly that for all on these that $x(x-4) < 0$. Thus

$$S = \{x \in \mathbb{Z} : 0 < x < 4\} = \{1, 2, 3\}.$$

Anther, and maybe better, way to do this is to graph $y = x(x-4)$



and note that the only integer points where the graph is below the $x$-axis are $x = 1, 2, 3$. □

**2.** Write the set $A = \{3, 6, 9, 12, 15, \ldots\}$ in set builder notation.

*Solution*: This can be done in several ways. Maybe the easiest is

$$A = \{3n : n \in \mathbb{N}\}$$

There is nothing special about using $n$. So we also have

$$A = \{3k : k \in \mathbb{N}\}$$
$$A = \{3x : x \in \mathbb{N}\}$$
$$A = \{3b : b \in \mathbb{N}\}$$

as correct answers. Anther correct answer is

$$A = \{3n : n \in \mathbb{Z},\ n \geq 1\}$$

**3.** What is the cardinality of the set $B = \{1, 2, \{3, 4, 5\}\}$? □

*Solution*: This set has the 3 elements 1, 2, and $\{3, 4, 5\}$ so $|B| = 3$. □

**4.** Draw a picture of the set $L = \{(x, y) : x, y \in \mathbb{R}, y = x^2, 0 \leq x \leq 1\}$.

*Solution*: $L$ is the points on the graph of $y = x^2$ with $0 \leq x \leq 1$ so the picture is