Name: _____

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

1. **[2 parts, 2 points each]** Determine the following sets.

   (a) $\bigcup_{n=1}^{\infty} \left[\frac{1}{n}, 1\right]$

   (b) $\bigcap_{n=1}^{\infty} \left[\frac{1}{n}, 1\right]$

2. **[6 parts, 1 point each]** Determine whether or not the following are statements. In the case of a statement, say if it is true or false, if possible. Briefly explain your reasoning.

   (a) $+8 + \times\mathbb{R}^2$

   (b) For all real numbers $x$ and $y$, if $xy = 0$ then $x = 0$ or $y = 0$.

   (c) The sum of two prime numbers cannot be prime.

   (d) If 3 plus 4, then 7.

   (e) The best color is purple.

   (f) There are integers $a$ and $b$ such that $a^2 + b^2 = 30$.